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FORESTRY ABSTRACTS

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FORESTRY ABSTRACTS

VOLUME 3 1941 NUMBER 1

FOREWORD

BEGINNING with the present number of *Forestry Abstracts* (Vol. 3, No. 1) some slight changes have been made in the composition of the journal and in the Decimal Classification System on which the index of forest literature is based.

First, the sections on book reviews and 'Notes from Annual Reports' have been omitted and the items formerly included in these are now placed separately under their appropriate decimal classification number in the 'Abstract Section', so that all the available material on any given subject, irrespective of its origin, will be found under one number or group of numbers of the subject index. Apart from the individual items from annual reports classified by subject, all reports that have been examined during the quarter are listed under '05.3 Annual Reports'. It is hoped that this change will increase the usefulness of *Forestry Abstracts* for those workers who are interested primarily in subject matter and only indirectly in its source. The section 'Notes from the Daily and Non-technical Press' will be retained in the same form as it has appeared in the past but will be included in the journal only when there is sufficient useful and interesting material to make it worth while.

Secondly, the simplified Decimal Classification System used with *Forestry Abstracts*, and issued with Vol. 1, No. 4 of this journal, has been slightly altered and somewhat expanded in order to increase its usefulness. Some of the more important changes include:

(i) The heading 12.12 is now restricted to teratology. All pathological papers, whether discussing protective measures or not, are referred to the appropriate subdivisions of 4, which is interpreted as covering all injuries to living trees. This has the great advantage of keeping together all papers on a particular disease, disorder or type of damage.

(ii) The broad subdivisions of 12.2 in the original International Classification have been taken up to separate the main groups of the vegetable kingdom. Bacteria, algae and fungi; lichens; mosses; ferns and their allies; gymnosperms; dicotyledons; and monocotyledons are now grouped under separate headings.

(iii) The section 21 'Silvicultural characters of tree species' has been expanded to receive 'adaptability to the general environment', 'habit of growth', and 'phenology', from 12.15; 21.5 has been dropped in favour of 12.11.2 (Propagation. Growth. Development); root systems are now classified under 12.14; and the sense of 21.3 has been extended to cover physical as well as chemical soil requirements. With these modifications it is believed that the subjects classified under 21 now form a coherent group.

(iv) Several subdivisions of 23.26 'Nursery practice' have been dropped in favour of broader duplicate titles; thus damage and protection in nurseries are now referred to the proper subdivisions of 4, composting and fertilizing are placed under 11.47.1, and the propagation of individual species, with or without the use of growth substances, is placed under 12.11.2.

(v) The section 32 'Harvesting of wood. Logging' has been modified, but the only considerable change is the opening of a new subdivision 32.9 for transport, formerly classified under 37. The new arrangement avoids the artificial separation of transport from other phases of the logging operation.

(vi) A new section 60 has been opened for general land management, i.e. land utilization in practice rather than as a policy, the latter aspect being dealt with under 97. The new section includes subdivisions for the management of non-forest land, e.g. range lands, as well as for different classes of forest, e.g. protection forest, productive forest under public ownership, productive forest under private ownership, estate and farm woodlands.

There will not be a general issue of the revised Decimal Classification System but a mimeographed copy may be obtained free of charge by any regular recipient of *Forestry Abstracts* on application to the Imperial Forestry Bureau.

FACTORS AFFECTING THE VEGETATIVE PROPAGATION OF FOREST TREES

PRACTICALLY all papers dealing with forest genetics emphasize the importance of vegetative propagation in the further development of certain aspects of this work [31, 34, 35, 36, 40, 44]. It is pointed out that this method is not only useful in propagating species that produce few or no seeds, or that are difficult to reproduce by seed, but that it is essential in maintaining in the progeny desirable inherent qualities, such as vigour, immunity to disease, or habit of growth, that have been observed in superior individuals. The fact that by this method trees can be propagated at an early age, before flowers develop, and in any year, whereas seed may be produced spasmodically, is an added advantage. Recognition of these facts has led to an intensification of research into the possibilities of the vegetative propagation of many forest trees of economic importance, and of the factors controlling its successful application.

A recent development in plant physiology that has further stimulated interest in problems connected with vegetative propagation has been, first the discovery in the growing parts of the plant of a group of substances known as auxins, one function of which is to initiate root growth, and secondly the isolation of artificial hormones (growth substances), notably indole and naphthyl derivatives, which when applied to plants may have the same effect as the natural auxins [3, 38, 39, 52]. The possible application of these synthetic chemicals to improve the vegetative propagation of valuable forest tree species is the subject of considerable research.

It is proposed to review briefly some of the data that have been obtained from recent investigations on the propagation of forest trees or closely related species from stem cuttings, and various techniques that have been tested for improving the propagation of certain 'difficult' species by this method. It should be borne in mind that while proper techniques have been developed for some species, much of the work under consideration is of a preliminary experimental nature, and that successful propagation under relatively ideal conditions does not necessarily mean that the problem has been solved.

NATURAL ROOTING ABILITY.

The natural rooting ability of a species is of course the first consideration in analysing its propagating potential. This varies widely from one species to another, even within the same genus, as has been observed by Vekhov [51], who recorded a variation in rooting of from 0 to 94 per cent. for 24 species of Maple, 0 to 78 per cent. for 21 species (or varieties?) of Beech, and 0 to 100 per cent. for 20 species of Ash. However, in general, certain deciduous species such as Willow, Basswood and Ash are recognized as being consistently easy to root, so much so that no particular skill is required in the collection and propagation of cuttings, while many other species, notably members of the Coniferae, are recognized as being consistently difficult if not impossible to propagate from cuttings, and early reports of the successful propagation of species of Pine by vegetative means have been welcomed as evidence of an important advance [13, 36]. Results from a number of investigations indicate that many of the so-called 'difficult' species can be propagated vegetatively. In fact, after experimenting with a large variety of trees and shrubs Vekhov [51] concluded that it is possible to propagate all such species vegetatively in some degree, it being only necessary to determine the optimum conditions that will bring about root formation within a reasonable time and permit the cuttings to survive until the roots are functioning.

CLONAL VARIATION.

Before considering the factors that affect the rooting and survival of cuttings it should be noted that even within a single species considerable variation in natural rooting ability may exist. Thus Deuber [8] has recorded a range of 16·6 to 90 per cent. rooting for a series of Norway Spruce (*Picea abies*) cuttings taken in December from individual parent trees each of which showed poor growth vigour, and experiments by Snow [43, 47] with a number of Red Maple (*Acer rubrum*) clones showed a wide range of rooting ability. Clonal variation has also been observed in the rooting of cuttings of White Pine (*Pinus strobus*) [8, 36]. Within the clone itself inherent conditions of growth and development tend to be uniform, as, apart from the occasional sport, members of a clone are genetically identical, being derived from a single plant by vegetative propagation. The importance of the clone in practical forestry has been discussed by Schreiner [40].

FACTORS AFFECTING THE VEGETATIVE PROPAGATION OF FOREST TREES

Factors that may have a significant influence on success or failure in propagating forest trees from stem cuttings may be separated into two groups: (*a*) natural factors that relate to the condition of the cutting at the time it is taken from the tree, and (*b*) applied factors, which include any mechanical or chemical treatment of the cutting either before or after collection, including the application of hormones or other substances, and the regulation of propagating conditions.

Natural Factors.

(*a*) *Time of collection and condition of cutting.*—For a few of the more readily rooted species it may not matter whether hardwood or greenwood cuttings are used. For other less adaptable species the time of year at which cuttings are collected from the tree may be a highly significant if not the most significant factor influencing the result. From an investigation into the vegetative propagation of a large variety of deciduous trees and shrubs by summer cuttings, carried out under conditions of mass propagation, Vekhov [51] reports that in the majority of species tested, including most species of *Acer*, *Alnus*, *Betula* and *Fagus*, and some species of *Fraxinus*, *Liriodendron* and *Magnolia*, a higher rooting capacity was found in young semi-herbaceous cuttings, whereas in other species, including *Acer negundo* and some species of *Betula* and *Catalpa*, the more mature shoots and branches gave the best results. Kirkpatrick [32] observed that for a number of coniferous species the best material from which to obtain cuttings was either the current year's or two years' growth and that cuttings taken in the spring, after new growth had started, showed little or no rooting.

More specifically, Deuber [8], Deuber and Farrar [6, 7] and Farrar [11] report that the rooting of cuttings from 39-year-old Norway Spruce varied greatly with time of collection, increasing rapidly in late autumn to a maximum of 89 per cent. in December and declining during the spring, the average rooting percentage of all cuttings increasing by 255 per cent. from October to December. Furthermore, cuttings collected in December and January produced more fibrous roots and a better root system, while January cuttings developed buds earlier and produced longer and more numerous shoots than those collected in the previous months. Working with the same species, Grace [16] and Grace and Farrar [19] found that the highest survival and best rooting were obtained with cuttings collected from November to January. Those taken in May, early June (partly new growth) and late June (new growth only) gave inappreciable rooting, even when treated with hormones and nutrients. Preliminary investigations by Farrar and Grace [12] indicate that time of collection is highly significant in determining the rooting response of cuttings of White Spruce (*Picea glauca*) and White Pine, late July being the best time for the first species and mid-August for the second. However, Deuber [8] has observed that White Pine cuttings collected in the spring and summer months failed to survive in appreciable numbers and that the best time to collect cuttings of this species appeared to be from December to March. Variation in propagation conditions may account for this difference.

The rooting response of cuttings treated with phytohormones has also been observed to vary with time of collection. For example, cuttings of Sitka Spruce (*Picea sitchensis*) and Douglas Fir (*Pseudotsuga taxifolia*) taken from December to March gave a better rooting response to optimum hormone treatment than those collected during the two months previous to or following that period [22], while Snow has shown that Aspen cuttings respond best to hormone treatment if taken just as the leaf buds are beginning to swell [41] and that greenwood cuttings of Sugar Maple (*Acer saccharum*) should be taken before the middle of July [42].

(*b*) *Position on tree from which cutting is taken.*—Experiments have shown that, at least for some species, the part of the tree from which the cutting is taken has an important bearing on its successful propagation. Grace [14], working with dormant Norway Spruce cuttings collected from a single tree, found that those from the lower third of the crown gave much better rooting than those from the upper third (86 and 48 per cent. respectively at the end of 19 weeks), and produced more than double the total length of roots of the latter. Further evidence of this was obtained in a later experiment [18]. Snow [45] reports that of seven different types of cuttings collected in July from 10-year-old White Pine trees and given identical hormone treatment, the best rooting response was obtained from 'lateral segments of the current season's growth on lateral branches in the lower portion of the tree'. Furthermore, Doran *et al.* [9] have shown that up to 70 per cent. of cuttings from the lower part of White Pine trees rooted following an optimum application of hormone solution, while cuttings from the upper part of the trees failed to root. Thimann and Delisle [50] observed that lateral shoots

of this species and Norway Spruce rooted more readily than terminals and that cuttings from the basal parts of 4- to 5-year-old plants of Red Oak (*Quercus borealis*) and Norway Maple (*Acer platanoides*) rooted better than those from apical parts. Hutchings and Larsen [29] found that for Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*), Soft Maple and Poplar (*Populus deltoides*) 'second' cuttings (=Fussstecklinge) gave better rooting, larger root systems, and more vigorous leaf growth than did terminal cuttings (=Kopfstecklinge), and Baak [2] and Hoffmann [27] agree that in Poplars the terminal cuttings make slower-growing and more crooked plants than cuttings from the lower part of the shoot. Furthermore, basal cuttings from the main stem of 1- and 2-year-old Rubber (*Hevea brasiliensis*) seedlings, both treated with hormones and untreated, gave a higher percentage rooted than those from higher up the stem. It may be noted that repeated trials with hormones and nutrients, and efforts to secure optimum rooting conditions before cuttings were actually taken from the tree, have failed to induce rooting in cuttings made from branches of Rubber or from scion shoots from budded plants [3]. The physiological reason for differentiation in rooting response with position of cutting is not clear, though it may be correlated with the differential distribution of natural root-inducing auxins [45] which in turn may find expression in monoecious species in the distribution of male and female flowers.

In discussing investigations on the growth of Poplar cuttings, chiefly *Populus serotina* and also *P. robusta*, Hoffmann [27] suggests that the natural factors affecting growth correlation in plants early determine the character of any particular branch or twig in the tree, thus the main leader and branches of the first few orders grow faster and more vertically than the ultimate branchlets. Such factors will operate in cuttings and the straightest and fastest growth and least mortality is shown by cuttings from leaders or subsidiary leaders, wound shoots, or water sprouts, provided that the two latter are sufficiently woody. The observation by Thimann and Delisle [50], that rooted laterals of Norway Spruce retain their plagiotropic habit of growth for at least one year while those of Pine apparently do not, may be noted in this connexion.

(*c*) *Age of tree.*—In general it appears to be true that cuttings taken from young trees root more readily than those from old trees. From experiments with White Pine cuttings receiving identical hormone treatment it was observed that by far the highest percentage (55 per cent.) of rooted cuttings was obtained from trees 5 years old and less [45]. Deuber [8] also found that cuttings taken from young White Pine gave a much higher rooting percentage than those from old trees, that there appeared to be a sharp drop in rooting capacity between the ages of 4 and 5 (69 and 26·4 per cent. respectively), and that seasonal variation in rooting ability was less apparent in the younger material. It may be noted that Doran *et al.* [9] succeeded in rooting as high as 70 per cent. of cuttings taken from the lower part of a 30-year-old tree of this species following treatment with relatively strong hormone solution (200 mg./l). Experiments with cuttings of Scots Pine (*Pinus sylvestris*) treated with hormones resulted in the rooting of 70 per cent. from 3-year-old trees compared with 10 per cent. from 20- to 25-year-old trees, and the optimum hormone application was found to be higher for the latter material than for that from younger trees [33]. Deuber [8] observed that Spruce (*Picea glauca* and *P. abies*) cuttings from young trees showed higher rooting percentages, quicker rooting, and rooting capacities varying less with season than those from older trees, and that cuttings from 4-year-old Eastern Hemlock (*Tsuga canadensis*) consistently rooted more freely than those from 20-year-old stock, both naturally and when treated. A similar variation with age in natural rooting and in response to treatment has also been observed for Larch (*Larix sibirica*) and in natural rooting for English Oak (*Quercus pedunculata*) [30, 33], while Thimann and Delisle [50] found that the age of the tree was the most important single factor affecting the rooting of certain species and that ease of rooting fell off steadily with age of tree for White Pine, Norway Spruce, Red Oak, Norway Maple and probably White Ash (*Fraxinus americana*).

Applied Factors.

A great deal of the more recent research on vegetative propagation has been concerned with methods for improving the survival and natural rooting ability of cuttings, and more particularly with investigating the value of phytohormones to improve the rooting ability of certain species that are notoriously difficult to propagate vegetatively under natural conditions. The artificial factors that may affect the survival and rooting of cuttings are here considered under four headings—

(*a*) Preliminary treatment. (*b*) Treatment with phytohormones. (*c*) Treatment with substances other than phytohormones. (*d*) Control of propagating conditions.

(*a*) *Preliminary treatment.*—There are a number of possible variations in the mechanics of collecting and preparing a cutting for chemical treatment or the propagating bed, such as the length of cutting and whether leaves or the wood of the previous season's growth are to be retained on the cutting, and if so, to what extent.

(i) Length of cutting:—The few data available on the effect of size of cutting on rooting ability do not give conclusive evidence, although the majority favour relatively short cuttings. Grace and Farrar [19] found that for an average of all treatments and collections of Norway Spruce cuttings taken from January to April, short (5–10 cm.) cuttings gave significantly better rooting than long (10–20 cm.) ones, while Deuber and Farrar [6, 7] report the opposite as true for cuttings collected from October to January, long (4–8 in.) cuttings being superior to short (2–4 in.) ones. However, Deuber [8] reports favourable results from the use of short (2–4 in.) cuttings of White Pine, and Snow [47] observed that 4-in. cuttings of Sugar Maple gave better rooting response than those 6 in. long.

(ii) Leaf area:—It is pointed out by Vekhov [51] that for many kinds of trees and shrubs the most efficacious cuttings are those from summer shoots in leafy condition, and Hitchcock and Zimmermann [25] have reported that, in general, hardwood cuttings of woody ornamental species respond much less readily to hormones when taken without leaves than when leaves are present. The number of leaves to be retained on a cutting should be such as to assure photosynthesis and normal translocation but at the same time keep transpiration at a minimum. An example of the harmful effect of reducing the leaf surface of coniferous cuttings is cited by Deuber [8], in which the removal of needles from the basal third of White Pine cuttings caused a reduction both in survival and rooting.

(iii) Heel of old wood:—Investigations with Norway Spruce cuttings by Grace [14, 15, 17] and Deuber and Farrar [6, 7] indicate that for this species at least the presence of a heel of the previous year's wood on the cutting tends to check rooting. In testing the rooting response of greenwood material of a number of species of shrubs and a few trees, Hitchcock and Zimmerman [24] used four types of cuttings—a mallet of the previous season's wood, a heel of the previous season's wood, a cut made at the base of the current season's growth, and a cut made $\frac{1}{4}$–$\frac{3}{4}$ in. above the base of current season's growth. Although no one type of cutting gave the best results for all species, in general the mallet type gave poor rooting while the cut at the base of the current season's growth was usually good. On the other hand, Kirkpatrick [32] reports that 'heeled' cuttings of conifers gave better results than those without heels, the material tested including species of *Abies*, *Chamaecyparis*, *Juniperus*, *Pinus*, *Picea*, *Taxus*, *Thuja* and *Tsuga*, as well as *Cryptomeria japonica*, *Cupressus macrocarpa* and *Sequoia gigantea*.

(*b*) *Treatment with phytohormones.*—Examples of the successful propagation of 'difficult' species by means of cuttings, following treatment with phytohormones, are listed in a table at the end of this paper. This is not intended to be a complete record of results but rather to indicate in a concise form the factors involved and the progress that is being made in this work. In addition to the examples listed, Thimann and Delisle [50] report the successful rooting of cuttings from old trees of *Taxus baccata*, *T. cuspidata*, *Tsuga canadensis*, *Picea pungens*, and *Keteleeria davidiana* treated with indoleacetic acid, and the improvement, following similar treatment, of the rooting percentage of cuttings from 3- to 5-year-old White Pine, Norway Spruce, White Ash, Red Oak and Norway Maple. It is suggested by these writers that root formation in the presence of optimal growth substance is apparently controlled by an internal factor whose amount and distribution vary with position in tree and age of tree. Other workers report positive results from hormone application in the rooting of Rubber cuttings [3] and in hastening and improving the rooting of many woody ornamentals including species and varieties of *Taxus*, *Thuja* and *Juniperus* [4, 5].

Hormone treatment may have beneficial effects apart from increasing the number of cuttings that are successfully rooted. Kirkpatrick [32] has pointed out that for conifers one of the most important results from such treatment was to increase the number of roots per rooted cutting, thus reducing the danger of loss from root breakage. This and other results, including increase in mean root length, increased survival of cuttings and an increased number of rooted cuttings with new growth, have

been reported in connexion with a series of experimental treatments of Norway Spruce [14, 17, 20]. The negative or even harmful effects of hormone treatment that have been observed in some cases may be due to any of a number of possible unfavourable factors that relate either to the condition of the cutting at the time of treatment, the concentration and method of treatment, or the propagating conditions. That cuttings collected under optimum conditions for natural rooting capacity do not necessarily show maximum response to hormone treatment is shown by the fact that the treatment of Norway Spruce cuttings taken when natural rooting was at its peak (November to January) reduced rooting, in some cases severely, whereas treatment of cuttings taken in April and June did somewhat improve it [8].

(i) Identity of hormones in use:—While a considerable number of chemicals are known to be physiologically active, only three of them—indolebutyric acid (IB), indoleacetic acid (IA), and naphthylacetic acid (NA)—have been used to any great extent in the experimental work that has been undertaken with cuttings from forest tree species. Each of these three chemicals has characteristics of its own and their relative effectiveness appears to vary with species of tree and also with concentration of chemical, method of application, season of year, and medium in which the cuttings are propagated. IA is reported as being the safest to use and as having a wider range of effectiveness than the other two chemicals when used in solution [38]. Some workers have found IB to be the most potent root-inducing substance for many evergreen species [32] and Griffith [22] has shown this chemical to be more effective than either IA or NA in rooting cuttings of Douglas Fir and Sitka Spruce; its consistent record in the list of treatments included at the end of this paper, which in each case is the optimum treatment of those tested, also suggests its superiority. Other findings indicate that the K salts of IA, IB and NA are consistently more effective than the acids, due apparently to greater solubility and hence greater penetrating power, and that IB and its K salt are more effective with most species than either IA or NA acids [26]. However, in experiments with hardwood cuttings of Black Locust (*Robinia pseudoacacia*) IA gave the best results (91·5 per cent. rooting) while NA was found to be nearly as effective but slower in action and IB gave relatively inferior results [49]. Furthermore, Komissarov [33] reports that IA was the most effective treatment for cuttings of Scots Pine. Thimann and Delisle [50] could find no significant difference in the effect of IA and its K salt on White Pine cuttings, and while in general IA was found to be slightly more effective than NA, it is suggested that the small differences recorded could easily be accounted for in the relative purity of the chemicals used. Baptist [3] reports that NA was more effective than either IA or two proprietary preparations in stimulating root formation on cuttings from Rubber. It has been pointed out that aqueous solutions of IB and IA lose their effectiveness much more rapidly than do those of NA [38, 49].

(ii) Concentration of hormone:—Hormones are applied to cuttings in rather dilute concentrations, the optimum for any species varying with the substance used, the rooting medium, age and condition of cuttings, time of year and method of treatment. As an example of the effect of time of year it has been pointed out by Hitchcock and Zimmerman [26] that cuttings from a number of species including *Taxus cuspidata*, *Thuja occidentalis* var., *Juniperus chinensis* var. *pfitzeriana*, *Chamaecyparis obtusa* vars., *Tsuga canadensis*, and *Abies veitchii* require higher concentrations of hormones to promote rooting when taken in October and November than at other seasons. Low and medium concentrations have been found to be more effective for a number of woody species than high concentrations, the latter being toxic to the cutting and inhibiting bud development or damaging the portion treated. Obviously a concentration that is optimal for root formation but is high enough to inhibit bud development to any great extent would not be of practical use. Deuber [8] reports that concentrations of IA and IB exceeding 10 mg./l. were exceedingly toxic to cuttings of Norway Spruce, sometimes causing the terminal buds and needles to dry out, redden, and drop off within the first month. Sometimes concentrations strong enough to cause basal damage may still stimulate root production above the damaged zone. It has been found that in general the more difficult a species is to root the higher the concentration of chemical required [38]. Thus Doran *et al.* [9] obtained the highest rooting response from White Pine cuttings with the highest concentration of hormone tested (200 mg./l.) applied for the shortest time (5 hours). A relatively high concentration of hormone is required to root cuttings of Black Locust and to prevent injury from this treatment pre-callusing of the basal ends of the cuttings has been recommended [49].

(iii) Solvents or carriers:—Various materials, including water, lanolin paste, talc powder, charcoal, and agricultural clay, have been tested for use as solvents or carriers to hold the active chemical at the required concentration during treatment. Different preferences have been expressed by individual workers but the majority of opinion appears to favour a talc-dust carrier. Hitchcock and Zimmerman [25] have suggested that an aqueous solution is preferable to lanolin as it is simpler, less laborious and appears to be effective in lower concentrations on more species of plants and also over a wider range of concentrations. The failure of lanolin treatments of summer cuttings of certain species is thought to be due, in part at least, to the checking of water uptake under conditions of high transpiration [10]. While aqueous hormone solutions have been used successfully with a number of species [1, 9, 22, 32, 33, 41, 42, 47, 49], Deuber and Farrar [6, 7] have observed that placing the bases of fresh cuttings of Norway Spruce in tap water for 24 hours was often associated with less rooting than that obtained with untreated cuttings planted directly in the propagating bed, and that solution treatments had certain detrimental effects that could not be ascribed entirely to the chemicals. The harmful effect of aqueous solutions of IA on cuttings of this species was demonstrated again by Grace and Thistle [18] and Grace and Farrar [19], though treatment of cuttings with IA in a talc powder at a concentration of 1,000 p.p.m. increased the number rooted and the mean root length [17], and Grace and Farrar [19, 21] obtained results suggesting that talc dust alone may be favourable to both the survival and rooting of Norway Spruce cuttings. Hitchcock and Zimmerman [26] have observed that talc controls rooted better than untreated or tap-water controls, apparently due in part to improvement of water relations and in part to foreign matter in the talc, which was found to be physiologically active. However, it appears that higher concentrations of hormone are necessary in talc dusts than in aqueous solution when used with the standard 24-hour treatment. Stoutemyer [48] and Oliver and Grace [38] favour dust carriers as being highly effective and having a number of advantages over other methods, particularly in regard to cost, and ease and simplicity of operation. Dry talc-dust treatments have been found to be less effective than those preceded by dipping the basal ½ in. in water, and the latter less effective than a preliminary dip in 50–95 per cent. ethyl alcohol. The effectiveness of these dips is attributed to increased penetration of the growth substance when a solvent is present on the treated surface [26]. Deuber [8] reports that fungal infection was more common in Norway Spruce cuttings treated with charcoal dust than in those treated with talc, and more common with talc than in the controls, and that charcoal gave more irregularity in the root systems than did talc. Chadwick and Kiplinger [4] found that treatments with a commercial dust preparation of NA did not damage the cuttings.

(c) *Treatment with substances other than phytohormones.*—Tests have been made of a number of substances other than hormones for possible use in improving the vegetative propagation of tree cuttings. Positive results from such treatments may be due either to a stimulating reaction similar to that caused by hormones, a response to the presence of nutrients, or simply to improvement of environment as in a case reported by Mirov [36] of the successful propagation of White Pine cuttings after soaking them in warm water for 2 hours, thus removing the oleoresin that sealed their ends and made water absorption difficult. According to Hutchings and Larsen [29] acetic acid in 1 : 10,000 aqueous solution, applied by watering every day for the first 3 of the 8 weeks of the tests, gave 28 per cent. rooting for Green Ash as against 12 per cent. in controls, and 100 per cent. for Soft Maple compared with 84 per cent. in controls, while a 5-per-cent. aqueous solution of sucrose applied by the same method reduced the rooting of Green Ash, Poplar (*P. deltoides*), and Soft Maple, and for the two latter it was associated with general unhealthiness and decay. Both organic mercury at a concentration of 50 p.p.m. and cane sugar in a 10-per-cent. solution have been shown to improve the survival of Norway Spruce cuttings not treated with phytohormones, while the first of these has increased rooting percentage to some extent and also increased the length of root per rooted cutting and the number of rooted cuttings with new growth [20]. Thimann and Delisle [50] have found that treatment with sugar for 3 days after application of phytohormone increased the rooting percentage of cuttings of White Pine and old White Ash, and decreased mortality in the former. Treatment with aneurin (vitamin B_1) after phytohormone treatment was slightly beneficial to cuttings of the same two species. Evenari *et al.* [10] have observed that in certain cases sugar may be of considerable value in stimulating root formation, and Oliver [37] reports that honey had a marked effect on the rooting of cuttings of *Thuja occidentalis* var. *pyramidalis*. Paraphenylene-diamine has been found

to stimulate rooting in a number of woody species, giving effects similar to those of IA, e.g. acting in a dilute solution (100–1,000 mg./l.), the optimum concentration varying with species.

(*d*) *Control of propagating conditions.*—Various experiments have shown that the conditions under which cuttings are propagated—that is the rooting medium, temperature, humidity, and any special treatment during propagation—may have a highly significant effect in determining the success or failure of the undertaking.

(i) Rooting media:—Differences in rooting media have been shown to be responsible for marked variations in the rooting response of cuttings of a number of tree species. The medium giving optimum propagating conditions will vary with species and their requirements in respect of aeration, heat, acidity, moisture, and availability of essential chemical elements. Experiments by Hitchcock [23] indicate that a mixture composed of equal parts of sand and peat is superior for the rooting of a variety of cuttings from tree and shrub species. This medium has also been found most satisfactory for Scots Pine, preferably with sphagnum moss peat [33], and White Spruce and White Pine, a well decomposed peat of native sedge origin giving much better results than European sphagnum moss peat, both as regards root production and new shoot development [12]. Furthermore the use of a 1 : 1 sand/peat mixture as a medium has been found to increase markedly the rooting percentage and the number and length of new-growth shoots of cuttings of Norway Spruce, both when used in conjunction with certain phytohormone treatments and independent of these, the stimulation of new growth probably being related to the nutritional value of the peat moss [20, 21]. Results from earlier tests with this species, in which it appeared that pure sand was preferable to a sand/peat mixture [19], suggest that the optimum rooting medium for Norway Spruce may vary with the season of the year in which the work is done. Snow [45] has reported that White Pine cuttings gave better rooting when propagated in 6 in. of a 3 : 2 sand/peat mixture on top of decomposed horse manure and bedding straw in a propagating bed that was covered at night with a sash than in a sand/peat mixture alone in an open bed covered with burlap. It is pointed out that a sand peat mixture that has been previously used for coniferous material gives particularly good results, and it is suggested that the presence of fungi in the medium may benefit the rooting of White Pine cuttings, possibly as a supplementary source of natural auxins [46]. However, Deuber [8] suggests that peat may be undesirable in the propagation of this species owing to the susceptibility of the cuttings to rot. He reports survival over the first 3 months to be best in pure sand. Thimann and Delisle [50] found that in general, peat or a 2 : 1 sand/peat mixture gave a slightly higher percentage of rooting than sand alone, while Kirkpatrick [32] reports a 2 : 1 sand/German peat moss mixture to be the best rooting medium for conifers. Iljin [30] observed that the admixture of sphagnum moss to the sand used as a substratum increased the rooting percentage for *Acer dasycarpum* and *Fraxinus viridis* and brought about a more vigorous development of the root system of the latter species than the use of sand alone, although *Quercus pedunculata* showed a higher rooting percentage in sand than in the sand-and-moss mixture. A fairly coarse sand has been shown to be superior to a sand/peat mixture in tests with Aspen [41], and Baptist [3] also found this material preferable to a number of other media in work with Rubber.

(ii) Temperature and light conditions:—Deuber and Farrar [6, 7] have emphasized the importance of greenhouse conditions in the successful propagation of Norway Spruce cuttings, and, following a number of experiments with this species and White Pine and Eastern Hemlock, it appears that the best environment for propagating cuttings from these species, both in regard to survival and rooting, is the open bench in the greenhouse with temperature at 66° to 76° F. and a relatively high atmospheric humidity [8]. In describing the greenhouse conditions most favourable to the propagation of a number of evergreens, Kirkpatrick [32] states that the optimum results were obtained with a temperature range of 60° F. at night to 75° F. in the day time. It is pointed out that hormone activity is substantially reduced at temperatures below 60° F. and that cold frames should be used only in the summer months. However, when the temperature is favourable the open frame may give results superior to the greenhouse, as has been observed by Grace [17, 20] in the propagation of a November collection of Norway Spruce cuttings treated with phytohormone solution, the difference between the two conditions being particularly noticeable with short (5–10 cm.) cuttings [19]. In a number of experiments with treated Scots Pine cuttings no rooting was observed in a cool hotbed at 20° to 25° C. while rooting up to 70–75 per cent. was obtained in a hotbed at 30° to

35° C. [33]. Although it has been reported that bottom heat is undesirable in the propagating bed for White Pine [50], it may be noted that an early successful attempt to propagate this species by cuttings (not treated with chemicals) reports the use of a coarse sand electrically heated [36].

If propagation is being undertaken in a greenhouse it is usually found necessary to reduce the natural light intensity. This may be done by a paint shade on the glass or by using a screen of cheesecloth or a lath shade.

(iii) Treatment during propagation:—It has been observed that the periodic addition of nutrient solution to the sand in which dormant Norway Spruce cuttings were planted significantly increased the number of rooted cuttings and those developing new growth, and reduced mortality [15]. Futhermore, survival of new-growth cuttings collected in late June was superior when propagated in sand watered with nutrient salts to those receiving water only [19]. However, the direct application of solutions of nutrient salts to cuttings of this species caused reduced rooting and increased mortality, and it is believed that this method is too drastic [18]. The application of vitamin B_1 solution to rooted cuttings of Eastern Hemlock and Norway Spruce has been found to improve the quality of both tops and root systems of the Hemlock but not the Spruce [8].

Conclusion.

In conclusion it may be stated that the investigations dealt with in this review furnish a fair cross-section of the work that is being done towards improving the vegetative propagation of forest trees and indicate the possibilities of this method under controlled conditions. Apart from the value of this work in making vegetative propagation a practical possibility for a number of valuable tree species there is a direct economic advantage in hastening the rooting of cuttings, as this means a larger and more rapid turnover of stock and a more efficient use of costly and specialized equipment.

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EXAMPLES OF RESULTS OBTAINED WITH OPTIMUM TREATMENT AND/OR OTHER SIGNIFICANT FACTORS

Species	*Workers*	*Date cuttings taken*	*Type of cutting*	*Treatment**	*Rooting medium*	*Per cent. rooted*		*Significant factors other than hormones*	*Remarks*
						Treated	*Control†*		
Acer rubrum.	Afanasiev [1].	9–10 July	4- to 6-in. greenwood with 1–2 sq. in. of leaf area, terminal bud removed and lateral buds intact.	IB 20 mg./l. 24 hrs.	River sand.	60	20 (5)	—	—
A. rubrum.	Snow [43, 47].	28 June.	6-in. from 2-year-old stump sprouts with only terminal leaves retained.	IB 200 mg./l. 6 hrs.	Sand/peat mixture.	17·5–97·5 (62·5)	0	Clonal variation.	—
A. saccharum.	Snow [42, 47].	12 June.	4- to 6-in. greenwood from 3- to 5-year-old seedlings, with only terminal leaves retained.	IB 50 mg./l. 3 hrs.	Sand/peat mixture.	65·8	35·3	Date of collection (before middle of July). Length of cutting (greater rooting from 4-in. cuttings).	—
Betula papyrifera.	Afanasiev [1].	20–22 July.	4- to 6-in. greenwood with 1 to 2 sq. in. of leaf area, terminal bud removed and lateral buds intact.	IB 20 mg./l. 24 hrs.	River sand.	50	0	—	Cuttings from 2-year-old wood failed completely.
B. populifolia.	„	14–16 July.	4- to 6-in. greenwood with 1 to 2 sq. in. of leaf area, terminal bud removed and lateral buds intact.	IB 5–10 mg./l. 6 hrs.	River sand.	30	10	—	—
Larix sibirica.	Komissarov [33].	—	—	IA 0·005 to 0·01 per cent. aqueous solution 24 to 48 hrs.	—	85	20–30	Age of tree.	—
Picea abies.	Deuber and Farrar [6, 7].	Mid-December.	2- to 4-in. and 4- to 8-in. dormant from terminal and lateral twigs at the end of lateral branches.	—	Sand.	—	89	Time of collection. Type of cutting (without heel of old wood). Length of cutting (4- to 8-in. superior to 2- to 4-in.).	—

EXAMPLES OF RESULTS OBTAINED WITH OPTIMUM TREATMENT AND/OR OTHER SIGNIFICANT FACTORS (*continued*).

Species	*Workers*	*Date cuttings taken*	*Type of cutting*	*Treatment**	*Rooting medium*	*Per cent. rooted*		*Significant factors other than hormones*	*Remarks*
						Treated	*Control†*		
P. abies.	Grace [14].	Mid-November.	2- to 4-in. dormant with heel of old wood.	—	—	—	75	Position on tree (from lower third).	43 per cent. rooting from upper third.
P. abies.	Grace [17].	November.	2- to 3½-in. dormant from upper portion of tree.	IA 1,000 p.p.m. in talc dust.	Sand and 1 : 1 sand/peat mixture.	42·5	32·9	Cuttings without heel.	IA at 5,000 p.p.m. and NA at 1,000 and 5,000 p.p.m. reduced rooting. Propagated in greenhouse.
P. abies.	Grace *et al.* [20].	15 November.	2- to 3½-in. dormant from upper portion of tree.	IA 5,000 p.p.m. in talc dust.	1 : 1 sand/peat mixture.	82·1	47·5	Rooting medium. Cuttings without heel. Propagating bed (outside frame).	NA at 5,000 p.p.m. reduced rooting.
P. glauca.	Farrar and Grace [12].	Late July.	5- to 10-cm. greenwood.	—	Mixture of sand and native peat of sedge origin.	—	80–90	Rooting medium. Time of collection.	—
P. sitchensis.	Griffith [22].	20 Feb.–30 Mar.	6-in. from lateral twigs of current season's growth with needles trimmed off basal portion.	IB 25·0 p.p.m. in aqueous solution 24 hrs.	1 : 1 coarse sand/peat moss.	100	0–10	Season of collection.	—
Pinus strobus	Doran *et al.* [9].	11 March.	2- to 4-in. long of current season's growth cut at junction with old wood.	IB 200 mg./l. 5 hrs.	3 : 1 sand/peat moss mixture previously used for coniferous material.	70	0	Cuttings from lower part of trees superior in survival and rooting.	Pre-treatment with 2·5 per cent. sucrose caused cuttings to live longer whether rooted or not.
P. strobus.	Farrar and Grace [12].	Mid-Aug.	5- to 10-cm. greenwood.	—	Mixture of sand and native peat of sedge origin.	—	50–60	Rooting medium. Time of collection.	—
P. strobus.	Snow [45].	4 August.	4-in. greenwood.	IB 25 mg./l. 6 hrs. and dipped in auxin dust.	3 : 2 sand/peat mixture over decomposed material.	47·5	35·0	Rooting medium. Propagating bed. Age of tree (5-yrs. and under). Position on tree (lower portion).	Fungi in rooting medium may benefit propagation.

Species	*Workers*	*Date cuttings taken*	*Type of cutting*	*Treatment**	*Rooting medium*	*Per cent. rooted*		*Significant factors other than hormones*	*Remarks*
						Treated	*Control†*		
P. sylvestris.	Komissarov [33].	5–12 July.	—	IA 0·01 per cent. aqueous solution 24 hrs.	1 : 1 sand/ sphagnum peat.	70–75	0	Age of tree: position on tree: season: lignification: rooting medium: temperature.	IA more effective than NA but optimum concentration higher.
Populus alba × *P. nivea.*	Afanasiev [1].	6–7 August	4- to 6-in. greenwood with 1–2 sq. in. of leaf area, terminal bud removed and lateral buds intact.	(1) IB 20 mg./l. 12 hrs. (2) IB 40 mg./l. 24 hrs.	River sand.	(1) 53 (2) 33	0 0		(1) Cuttings from root sucker. (2) Cuttings from 2-yr.-old wood.
P. tremuloides and *P. grandidentata.*	Snow (41).	Late March.	6-in. with basal end cut at 45°.	IB 10 mg./l. 27 hrs.	Fairly coarse sand.	66·8	5·0	Season of collection (end of dormant season). Rooting medium.	IA less effective.
Pseudotsuga taxifolia.	Griffith [22].	20 February–30 March.	6-in. from lateral twigs of current season's growth with needles trimmed off basal portion.	IB 50·0–75·0 p.p.m. in aqueous solution 24 hrs.	1 : 1 coarse sand/peat moss.	80	0	Season of collection.	
Quercus pedunculata.	Komissarov [33].	—	—	IA 0·005–0·01 per cent. aqueous solution 24–48 hrs.	—	80	10–15	Age of tree.	—
(1) *Robinia pseudoacacia* and (2) var. *rectissima.*	Stoutemyer *et al.* [49].	(1) 17 Jan. (2) 28 Feb.	6- to 8-in. hardwood preferably > 12 mm. in diameter.	(1) IA 100 mg./l. 20 hrs. (2) IA 100 mg./l. 24 hrs.	—	(1) 91·5 (2) 85·0	— 0	—	Basal ends of cuttings must be well calloused before treatment.
Thuja occidentalis var. *pyramidalis.*	Oliver [37].	—	—	Honey 25 per cent. solution 24 hrs.	—	64	0	—	—
Tsuga canadensis.	Deuber [8].	November.	—	IB 4 mg./g. in talc dust.	—	92·5	37·5	Age of tree (cuttings from young trees superior in rooting).	—

* The optimal treatment of those tested is given here.

† When no chemical treatment is involved or when the significant factor is other than chemical treatment, the maximum rooting obtained in the test is recorded under 'control'.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

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09.2. *Pre-history*

09.2 (410). GODWIN, H., and TANSLEY, A. G. **Prehistoric charcoals as evidence of former vegetation, soil and climate.** *J. Ecol.* 29, 1941 (117–26).

In this criticism of a recent paper by Salisbury and Jane [*For. Abs.* 2 (181)] the chief points raised and discussed are:—(i) That the evidence for the existence of closed Oak/Hazel woodland on the Dorset downs is open to question in several respects. (ii) That the evidence of vegetational and soil changes disagrees with the general framework of knowledge of the period and is also open to other objections. (iii) That the material presented is insufficient for any general statement on climate.

09.2 (43.1–5). SELLE, W. Der Bestockungsanteil der Buche, Hainbuche, Eiche und Birke in Nordwestdeutschland auf Grund von pollenanalytischen Untersuchungen. **[The status of Beech, Hornbeam, Oak, and Birch in the woodlands of north-west Germany on the basis of pollen-analytical investigations.]** *Z. Forst- u. Jagdw.* 73, 1941 (65–108). [G.g.]

The pollen-analytical data on the past distribution of these species are well in accordance with their climatic and edaphic requirements.

09.2 (79.7) : 11.21. HANSEN, H. P. **Paleoecology of a montane peat deposit at Bonaparte Lake, Washington.** *Nthwest. Sci.* 14 (3), 1940 (60–8). Biol. Abs. 15 (89).

Pollen analysis of a post-Wisconsin peat deposit in northern Washington indicates that the pioneer forests to invade adjacent areas consisted chiefly of *Pinus contorta* and *P. monticola*, with some grass. The former was gradually replaced to a large extent by *P. ponderosa* and *Pseudotsuga*, with a preponderance of *P. ponderosa*. *P. monticola* remained static and was apparently never predominant. A decrease in *P. ponderosa* in the upper levels is difficult to attribute to climatic change and may be due to normal succession or to an interruption of succession by fire or disease. The forest succession suggests a gradual drying and perhaps some warming to a maximum when *P. ponderosa* attained its maximum, from which time the climate has remained about the same. *From author's summary.*

09.2 (494). LÜDI, W. Études sur la partie occidentale du Lac de Genève. Analyse pollinique des sédiments du Lac de Genève. **[Studies on the western part of Lake Geneva. Pollen analysis of Lake Geneva sediments.]** *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève* 41 (5), 1939 (467–97). [F.f.] O.R.S.

The relative abundance of pollen of various forest species in sediments of Lake Geneva indicates the following main phases of succession:—*Pinus*/*Salix* with much *Hippophaë*; *Betula* with much *Salix* and *Hippophaë*; *Pinus*; *Betula*; *Corylus*/*Pinus*; *Corylus*/mixed *Quercus*; mixed *Quercus*; *Abies*. In the post-*Abies* deposits *Quercus* was most often dominant and *Abies*, *Fagus*, and *Alnus* dominant from time to time. In the most recent phases the pollen of *Pinus* is dominant. These and other findings are discussed in some detail.

09.4. *Forest Statistics*

09.4 (45) : 98.1. Der jährliche Holzbedarf Italiens. **[The annual timber consumption of Italy.]** *Dtsch. Holzanz.* No. 96, 1939. [G.] Forstl. Rundsch. 12 (209). H.S.B.

Estimated at 23–24 million cu. m., or 0·55 cu. m. per head. 13 per cent. has to be covered by imports.

09.4 (46) : 98.1 : 33.32. Holzzellstoff in Spanien. **[Wood pulp in Spain.]** *Holzhandelsbl.* 22 (66), 1939. [G.] Forstl. Rundsch. 12 (209). H.S.B.

The annual consumption is 176,000 metric tons, of which about 25,000 tons are derived from home production. Expansion of the latter is contemplated.

09.4 (485). Riksskogstaxeringen av Ljungans, Indalsälvens och Ångermanälvens flodområden åren 1938 och 1939. **[State Forest Survey of the river basins of the Ljunga, Indalsälv, and Ångermanälv, 1938 and 1939.]** *Skogsägaren* 17, 1941 (11–5). [Sw.]

09.4 (485). Skogarna i Mellan-Norrland. Riksskogstaxeringens resultat för Ljungans, Indalsälvens och Ångermanälvens flodområden. **[The forests of central Norrland. Result of the State Forest Survey of the river basins of the Ljunga, Indalsälv, and Ångermanälv.]** *Skogen* 28, 1941 (37–43). [Sw.]

In these two articles, the second of which is the more detailed, data are presented from the 1938–39 State Forest Survey of the Ljunga, Indalsälv, and Ångermanälv river basins in central Norrland. The data are considered separately (i) for the three river basins taken as a whole and individually, and (ii) for different classes of ownership.

(i) Productive forest land occupies 41,013 sq. km., or 75 per cent. of the land area below the timberline. The Ångermanälv, Indalsälv, and Ljunga basins contain 18,956 sq. km., 13,000 sq. km., and 9,057 sg. km. of forest land, respectively. The chief kinds of coniferous forest, in percentage of the forest area, are pure Scots Pine 10·5, mixed coniferous forest 9·0, and pure Norway Spruce 39·4. For the whole area the average site quality is 3·10 cu. m. per ha., the corresponding averages for the Ljunga, Ångermanälv, and Indalsälv basins being respectively 3·42, 3·07, and 2·94 cu. m. per ha. The total volume under bark for trees of all species 10 cm. and upwards in diameter is 210·3 million cu. m.; of this 57·2 per cent. is Spruce, 26·5 per cent. Pine, 13·4 per cent. Birch, and 2·9 per cent. other species. Expressed per ha., the volume under bark is 48·8 cu. m. for the whole area and 57·8, 46·5, and 45·2 cu. m. for the Ljunga, Indalsälv, and Ångermanälv basins, respectively. The younger age classes are most frequent in the Ljunga basin, and the older age classes in the Ångermanälv basin. The aggregate current annual increment of Pine and Spruce over 10 cm. in diameter is set at 1·33 million cu. m. for the Ljunga basin, 1·55 million cu. m. for the Indalsälv, and 2·03 million cu. m. for the Ångermanälv. Since the first survey of the area in 1924–25 the main changes have been: (*a*) An improvement of over 10 per cent. in the average site quality of the Ljunga and Ångermanälv basins. (*b*) A decrease of pure Scots Pine and mixed coniferous forest, and an increase of pure Norway Spruce in percentage of the forest area, though there has been little change in the percentages by volume in the various species. (*c*) The total volume for all species has dropped by 5·8 million cu. m., and the volume per ha. by 3·1 cu. m. The general lowering is due chiefly to cuttings in overmature forest, e.g. the volume of Pine in the overmature and cull class has declined from 9·8 to 2·6 million cu. m., and that of Spruce in the same class from 34·5 to 18 million cu. m. On the other hand, there have been marked increases—about 50 per cent. for Pine and about 15 per cent. for Spruce—in the stocking of the class comprising 'older trees ripe for cutting and mainly sound'. (*d*) Pine increment has decreased and Spruce increment increased since the previous survey, the increase of Spruce increment outbalancing the decrease of Pine.

(ii) The percentages of forest land in different classes of ownership are:—private forests other than company forests 44·7, company forests

39·7, crown forests 10·1, and public forests other than crown forests 5·5. Average site quality for these classes decreases in the same order, the figures being 3·19, 3·15, 2·87, and 2·54 cu. m. per ha. When all diameter classes are taken into account the volume under bark for all species, per ha., also follows the same order, with 59·2, 54·4, 53·1, and 50·1 cu. m., respectively. If, however, the diameter classes below 15 cm. in diameter are disregarded, conditions are practically reversed and the order is:—crown forests 36·1, other public forests 35·5, private forests other than company forests 35·2, company forests 32·4 cu. m. per ha. The same trends are naturally true for the distribution of the age classes. Public forests thus contain a higher proportion of the older and overmature timber, due to the heavier cutting of such material in the private forests. As to silvicultural conditions, the need for cleanings is less in the public than in the private forests. Actual cleanings carried out have about the same extent in public and company forests, but a lesser extent in other private forests. The area thinned has been greatest in the private forests other than company forests and least in the public forests. It is probable, however, that many fellings classed as thinnings in the former type of ownership would be termed cleanings under other types of ownership, as the peasant owner can utilize timber down to much smaller dimensions. Completed regeneration fellings have about the same extent under all classes of ownership except that of public forest other than crown forest, where their extent has been considerably less.

09.4 (485) : 32.92–4. Olsson, E. Flottningen under år 1939. **[Floating during the year 1939.]** *Skogen* 28, 1941 (23–5). [Sw.]

A total of 138 million logs with an aggregate volume of 450 million cu. ft. (12·7 million cu. m.) was floated on Swedish waterways during 1939, representing decreases of 27·0 per cent. by log number and 24·6 per cent. by volume on the 1938 figures. Logs actually delivered to the timber owners totalled about 136 million with a volume of about 444 million cu. ft., of which 25,022,000 logs (182,986,000 cu. ft.) were saw timber and 110,699,000 logs (261,170,000 cu. ft.) were smaller dimensions. These figures show little change in volume of sawlogs, but the smaller timber has decreased by 31·0 per cent. by log number and 34·8 per cent. by volume as compared with the figures for 1938. Some data are given on floating costs and on the finances of the floating companies during the year, and a table is presented to show in detail the amounts of timber floated on particular watercourses.

09.4 (485) : 33.06. Vedavverkningen fram till årsskiftet. **[Fuelwood fellings up to the end of the year.]** *Skogen* 28, 1941 (47). [Sw.]

The total fuelwood cut of Sweden for the season 1.viii.1940 to 30.vi.1941 was prescribed as 30,000,000 cu. m. stacked measure, of which it was estimated that 10,000,000 cu. m., or 34 per cent., should be cut before the end of 1940. The actual cut up to this date totalled 12,611,600 cu. m. A table shows the distribution of the estimated and actual fuelwood fellings over the various counties.

09.4 (495). Geete, E. Greklands skogar. **[The forests of Greece.]** *Skogen* 28, 1941 (22). [Sw.]

The forests of Greece cover about 2,400,000 ha. or about 20 per cent. of a total land area of 130,000 sq. km. The forest area per head of population is 0·35 ha. The total annual increment was estimated recently at 3·9 million cu. m., and the annual cut at 377,000 cu. m., or 0·15 cu. m. per ha. The last figure is probably too low, though during 1935–7 timber imports amounted to about 400,000 cu. m. annually. Reasons for the low annual cut are past overcutting, damage by domestic animals, and the inaccessibility of large areas of mountain forest. In 1937 a law was passed that partially forbade forest grazing: grazing was to cease within 4 years over two-thirds of the forests of the country, this area being estimated to comprise 230,000 ha. of Silver Fir, 90,000 ha. of Pine, 670,000 ha. of Oak, and 190,000 ha. of Beech. Grazing was also partially prohibited on the remaining forest area in places where mountain torrents are dangerous or in areas used for charcoal-burning. Natural regeneration has appeared on protected areas. Extensive forest plantings have been started in eroded areas. The State owns about 70 per cent. of the forest area and is planning to effect general improvement in utilization and silviculture.

09.4 (71) : 33.12 : 33.4 : 12.26–8. **Preliminary report on the hardwood flooring industry in Canada 1939.** Dominion Bureau of Statistics, Ottawa. 1940. pp. 8. [E.F.]

09.4 (71) : 33.12 : 33.4 : 33.13. **The woodenware industry [in Canada], 1939.** Dominion Bureau of Statistics, Ottawa. 1940. pp. 2. [E.F.]

09.4 (71) : 33.16. **Excelsior [in Canada], 1939.** Dominion Bureau of Statistics, Ottawa. 1940. p. 1. [E.F.]

Statistics for industries manufacturing wood excelsior and excelsior products.

09.4 (71) : 33.32. **Preliminary report on the pulp and paper industry in Canada, 1939.** Dominion Bureau of Statistics, Ottawa. 1940. pp. 37. [E.F.]

09.4 (71) : 33.37 : 12.26–8. **The hardwood distillation industry [in Canada], 1939.** Dominion Bureau of Statistics, Ottawa. 1940. pp. 4.

09.4 (71 : 94) : 98.3. BOWER, R. P. **The market for Canadian lumber in Australia.** *B. C. Lumberm.* 25 (2), 1941 (36–42).

During the past five years Canada exported to Australia each year an average of approximately 300 million bd. ft. of unmanufactured or partially manufactured wood, consisting of Hemlock flitches, Douglas Fir logs and sawn timbers. Factors that must be considered in relation to the future of this market include Australian resources and consumption, building restrictions, market requirements, licensing regulations, and the effect of tariff on timber imports.

09.4 (71.1 : 71.2) : 98. **Manufacturing industries of the Province of British Columbia (including Yukon), 1938.** Dominion Bureau of Statistics, Ottawa. 1940. pp. 20.

09.4 (728.2) : 98.3. BRITISH HONDURAS. **Trade and information report for quarter ended 30th September, 1940.** Govt. Printer, Belize. 1940. pp. 7.

Shipments of logs to the end of September amounted to 2,960,665 bd. ft. of Mahogany and 288,212 bd. ft. of Cedar, all to the U.S.A. Shipments of lumber to the U.K. for the nine months' period totalled 3,957,467 bd. ft.

09.4 (728.2) : 98.3. BRITISH HONDURAS. **Trade and information report for quarter ended 31st December, 1940.** Govt. Printer, Belize. 1941. pp. 7.

09.4 (73) : 98.1. REYNOLDS, R. V., and PIERSON, A. H. **Lumber distribution and consumption for 1938.** *Misc. Publ. U.S. Dep. Agric.* No. 413, 1941. pp. 59. [Division of Forest Economics, Forest Service, U.S.D.A.]

09.4 (75.6). CRUIKSHANK, J. W. **Forest resources and industries of North Carolina.** *Sth. Lumberm.* 161 (2033), 1940 (179–84). [Appalachian Forest Exp. Sta.]

09.4 (75.8). LEHRBAS, M. M., and ELDREDGE, I. F. **Forest resources of South Georgia.** *Misc. Publ. U.S. Dep. Agric.* No. 390, 1941. pp. 50. [Southern Forest Exp. Sta.]

Of a total area of 15,297,100 acres 65·9 per cent. is forest and 71 per cent. of this has turpentine-producing Pines as dominant species. Seventy-seven per cent. of the forest area has thrifty, second-growth timber and in 1934 the total net saw-timber volume exceeded 18·5 billion bd. ft. of which 68 per cent. was in Pines, 26 in hardwoods and 6 in Cypress. The total cordwood volume was 107 million cords. In 1936 the forest drain for all species exceeded increment by 70 million bd. ft., the deficit in Cypress and Pines exceeding a net increment for hardwood by this amount.

09.4 (78.6 : 79.6 : 79.7) : 98.3. **Preliminary 1939 log prices in the Northern Rocky Mountain Region.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 7, 1940. pp. 2.

09.7. *Monographs of Individual Forest Regions*

09.7 (43.9) : 12.19 : 11.2 : 38.62. SZÁNTÓ, I. Erdötenyészet, éghajlat és lecsapolás a Kárpátok medencéjében az Alföldre való tekintettel. **[Forestry, climate, and drainage in the Carpathian basin in relation to the Hungarian Great Plain.]** Röttig-Romwalter Nyomda R.T., Sopron. 1940. pp. 252. [Hu.g.f.e.] Biol. Abs. 15 (75).

09.7 (54.1). JACOBS, M. C. **The forest resources of Assam.** Assam Govt. Press, Shillong. 1940. pp. 48.

A list is given of Assam timbers and Bamboos, grouped according to their uses, and addresses of authorities from whom to obtain further particulars. Notes are included on the forests of Assam and forest administration; forest types and main timber trees; minor forest produce; grazing and fodder; present methods of forest exploitation; means of extraction and transport; methods of conversion; and measures necessary for the better utilization of the forests. Also a discussion of

the dangers to Assam from a too low percentage of reserved forests (9·7 per cent. of the land area) and lack of a stable policy with regard to 'unclassed' State forests, in which 'everything is permitted unless expressly prohibited'. These forests suffer heavily under indiscriminate shifting cultivation, grazing controlled only as regards realization of grazing fees, indiscriminate cutting of household requirements by settlers, and squatting. Notes on over 70 Assam timbers are appended.

09.7 (54.7). MIRCHANDANI, T. K. **Kanara forests.** *Indian For.* 67, 1941 (62–7).

Forests cover nearly four-fifths of the Kanara District, which is situated on the south-west edge of the Deccan Plateau with elevation ranging from sea level to 2,000 ft. The climate is hot and moist with little winter and a rainfall varying from 40–50 in. in the east and north to over 200 in. towards the south-west. There are three main forest types—the tropical rain forest, the Teak-bearing, deciduous high forest, which is by far the most important, and the deciduous pole forest. The management and products of these forests and methods of exploitation are discussed briefly.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.14. Precipitations

11.14.3 (59.5). WATSON, J. G. **Rainfall records.** *Malay. For.* 10, 1941 (16–9).

Rainfall at the Forest Research Institute, Kepong, during 1928–39.

11.4. *Soil*

11.4 (729 : 73) : 07.8. MILNE, G. **A report on a journey to parts of the West Indies and the United States for the study of soils, February to August, 1938.** East African Agricultural Research Station, Amani, Tanganyika Territory. 1940. pp. 78.

On pp. 30–1 the author quotes examples from Trinidad and British Guiana showing the danger of basing general estimates of soil fertility on the stature and luxuriance of virgin forest. Such estimates are valid for the particular forest crop on its own undisturbed soil, but not necessarily so once the reaction of the forest upon soil properties is interrupted for the purpose of permanent cultivation or even for temporary cropping to be followed by the establishment of commercial forest stands. In the examples quoted, land intended for permanent cultivation had become derelict a few years after the luxuriant virgin forest had been felled, while giving over the ground to cultivation for one year only resulted in the failure of replanting operations. An example is reported on pp. 66–7 of successful use of one of the forest types of Trinidad for its indicator value in interpreting, by means of aerial photography, topography and hence geology.

11.4 : 21. TKACHENKO, M. E. **Influence of various tree species upon soils.** *Pedology* 1939 (10), (3–16). [R.] H.S.B.

A review of present knowledge on this subject.

11.41. Soil Physics

11.41 : 11.49 : 11.62. GULISASHVILI, V. Z. **Physical properties of soils of the alpine and forest zones and their rôle in the hydrology of the country.** *Pedology* 1940 (5), (32–45). [R.e.] H.S.B.

Using Burger's technique, porosity, water and air capacity, and permeability were studied on soils of the Caucasian range. Porosity and water capacity were greater in mountain meadow soils than in the brown earths of the forest zone, but the latter soils had a considerably greater air capacity and permeability. The difference in the permeability of the two kinds of soils was particularly great during the snow-thawing period, when the mountain meadow soils were so frozen as to be almost impermeable while the forest soils were hardly frozen at all. Thus mountain meadow soils increase run-off and their encroachment on the forest zone is undesirable. In the peat soils of the alpine zone bearing a *Rhododendron* vegetation, air capacity and permeability were even higher than in the brown earths of the forest zone, but owing to their relative scarcity these peat soils are of little hydrological importance.

11.41.1 : 11.11.2 : 11.22 : 91.3. BELOTELKIN, K. T. **Soil freezing and forest cover.** *Tech. Note Ntheast. For. Exp. Sta.* No. 37, 1940. pp. 4.

Preliminary observations have shown that freezing prior to snowfall was delayed in soils protected by tree growth, while moisture present in the litter, humus and upper layers of the mineral soil formed snow-like crystals enabling the soil to maintain a good degree of permeability far into the winter; hence the favourable effect of forest cover on early winter floods.

11.41.3 : 11.44 : 11.42.33. MAŘAN, B. Použití moderních pedofysikálních metod v lesnictví. **[Physiological utilization of water in the humus layer and in hardpan soils.]** *Lesnická Práce* 19, 1940 (1–12). [Cz.g.f.] Biol. Abs. 15 (6193).

Determinations were made, on the basis of hygroscopicity, of the physiologically available and non-available water in humus and in hardpan soil. The amount of available water in raw humus is generally unfavourable for plant growth except during rainy periods; in mull more of the water is available. In degraded sandy hardpan soils more available water is found in the illuvial than in the eluvial horizon.

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 01.6. KELLEY, A. P. **Additions to the literature of mycorrhizae.** Landenberg, Pennsylvania. 1941. pp. 13. *Suppl.* No. 4 to *The Literature of Mycorrhizae.*

A current bibliography with abstracts.

11.43.1 : 11.42.2 : 11.44 : 12.25. HALE, J. M., and HALVERSEN, W. V. **The enumeration of ammonia-oxidizing bacteria in forest litter.** *Abstract* in *Journal of Bacteriology* 39, 1940 (100–1). [Yale University.] O.R.S.

Examination of soil samples from White Pine forest in northern Idaho showed that in spite of a lack of nitrates in most samples, ammonia-oxidizing bacteria were present. In samples of air-dried litter stored at room temperature for over a year little or no decrease occurred in the number of such bacteria.

11.43.1 : 11.47.21 : 23.3 : 12.25. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939-40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

The use of organic composts makes possible the raising on heath and moorland sites of Pine planting stock with mycorrhizal development superior to that of seedlings from the regular forest nursery. Composts prepared with *Molinia* and Bracken have been used successfully (p. 7).

11.43.1 : 12.25 : 11.49. KELLEY, A. P. **The variations in form of mycorrhizal short-roots of *Pinus virginiana* Mill. associated with certain soil series.** The Landenberg Laboratory, Landenberg, Pennsylvania. 1941. pp. 10.

Field studies of *Pinus virginiana* roots in Chester, Dekalb, Conowingo, and Sassafras soil series showed that the species is mycorrhizal in all four series and that mycorrhiza were not only abundant but occurred in all but one of them to the exclusion of root hairs, which were found only in Chester loam, the soil that is considered best for agriculture. The usual mycorrhizal forms—racemose, coralloid, tuberous, and rhizothamnic—occurred in all soils, and dichotomy of the root tip and white tips of renewed growth were constant characters. Certain mycorrhizal types, however, were commoner in certain soils; thus those in sandy soils had predominately coralloid form, while clay or silt soils tended to produce racemose or elongate, simple mycorrhiza. Pseudomycorrhiza were found in heavy Conowingo clay and the mycorrhiza approached a pseudomycorrhizal form in a wet-clay phase of Chester soil. Seedlings growing in a black humus layer over clay had racemose or coralloid mycorrhiza in the humus but became pseudomycorrhizal in the clay beneath. Necklace mycorrhiza, caused by intermittent growth, were found only in Dekalb soil, a fine sandy soil subject to drought. Fine white rootlets like rhizomorphs were found in humus layers where active growth had occurred late in the season; they were covered with root-hair-like setae that were distributed impartially over the whole root system, including the root tips.

11.43.2 : 11.44. JOHNSTON, J. W. **Forest soil biota in relation to soil transformation.** *Fox Forest Notes* No. 22, 1940. p. 1.

Biological activity was found to be scarce in mor humus types following drastic exposure as a result of hurricane damage, whereas activity was satisfactory in mull soils. To encourage the presence of soil biota and thus bring about desirable soil development certain minimum moisture and food requirements are necessary, such as the presence of young hardwoods, which provide particularly favoured worm foods.

11.43.2 : 11.44 : 12.19.2 : 12.25. JOHNSTON, J. W. **A mull-forming biota under the Red and White Pine type.** *Fox Forest Notes* No. 23, 1940. p. 1.

Fairly active earthworms (*Allolobophora* sp.) at the rate of 1 to 25 per sq. m. to a depth of 15 cm. were found in a typical Pine site of moist, gravelly silt sand, bearing little herbaceous vegetation. These conditions are tending to produce a coarse mull.

11.44. Surface Humus. Litter

11.44 : 12.19.2 : 21.8. SAKHAROV, M. I. **Organic litter in forest associations.** *Pedology* 1939 (10), (17–24). [R.] H.S.B.

Report on measurements of the periodicity and amount of leaf fall in different forest types, chiefly in Bryansk.

11.44 : 12.26–8 : 11.48.2. PETRAČIĆ. **On the decomposition of hardwood litter in general and on gravelly sand soils in particular.** *Šumarski List* 63, 1939 (57–65). [Croat.] Forstl. Rundsch. 12 (135). H.S.B.

The speed of litter decomposition increased by species as follows: Hornbeam and Alder, Chestnut, Oak and Beech.

11.45. Geological Conditions. Soil Surveys

11.45.9 (941). BEDNALL, B. H. **A soil survey of Myalup plantation (*P. pinaster*) area.** *Aust. For.* 5, 1940 (120–8).

11.47. Maintenance of Favourable Soil Conditions

11.47.1 : 12.25 : 21.3 : 11.42. NĚMEC, A. Über die Wirkung einer Stickstoffdüngung junger Fichten auf die Nährstoffaufnahme der Nadeln in Abhängigkeit von der Bodenreaktion und von dem Nährstoffhaushalt des Bodens. **[On the effect of nitrogen fertilizing of young Spruce on the nutrient uptake of the needles as dependent upon the soil reaction and the nutrient status of the soil.]** *Bodenk. u. PflErnähr.* 17, 1940 (204–35). [G.] Biol. Abs. 15 (2875).

11.47.12 : 12.24 : 44.1. RAYNER, M. C. **Bracken compost.** *Nature, Lond.* 147, 1941 (641). [Bedford College, University of London.]

Highly satisfactory results have been obtained from experiments with bracken composts in tree nurseries. Green leaves, collected and dried in July, gave slightly better results than dead ones collected in October. [Cf. *For. Abs.* 1 (129).]

11.47.13 : 21.3. IOWA. **Report on agricultural research for the year ending 30th June, 1940. Pt. I. Project reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames. [1940?]. [Forestry Section pp. 184–8.]

Responses to the addition of mineral nutrients by 2-year-old seedlings of Ash, Oak and Jack Pine grown on a sandy loam subsoil were: Ash—potassium none, phosphorus none, nitrogen produced a 30- to 40-per-cent. increase in dry weight and a 50-per-cent. increase in height of 2-year seedlings. Oak—nitrogen not significant, phosphorus resulted in a 100-per-cent. increase in weight. Jack Pine—100 lb. of P_2O_5 and 80 lb. of NH_3 per acre increased dry-weight yields by more than 3,500 per cent. in 2 years. Both Green Ash and Red Oak showed a much higher yield when grown on the A horizon of two different soils than on the B horizon of the one and on the C horizon of the other. Seedlings of Green Ash and Black Locust that grew very poorly on an eroded, acid, infertile C horizon soil, showed a marked response to phosphorus but practically none to nitrogen alone (pp. 186–8).

11.47.13 : 23.3 : 11.62.11 : 44.1. HOLSOE, T. **Fertilizing planting stock on eroded soils.** *J. For.* 39, 1941 (69–70). [West Virginia University.]

An experiment to determine the effect of a 4–12–4 nitrogen, phosphorus, potash fertilizer on tree growth on eroded soils showed that, even when the fertilizer was placed 6 in. below the soil surface, weed growth was increased and only fast-growing tree species such as Black Locust could successfully compete with it. Slow-growing, intolerant tree species should not be fertilized during the year of planting unless weed competition can be prevented.

11.47.2 : 11.44 : 11.48.2 : 23.22.2. HASSENKAMP, W. Die Umwandlung von Rohhumusböden in Mullböden durch Waldfeldbau und Leguminosenanbau. **[The conversion of mor into mull soils by means of regeneration in combination with field crops and the cultivation of leguminous plants.]** *Forstarchiv* 17, 1941 (41–57). [G.]

The author reports on his experience in the improvement of podzolized silt loams in

Hanover. These soils are notoriously lime- and colloid-deficient and form thick layers of raw humus under a coniferous crop. The operations described included (1) poisoning of *Aira* and ferns with 'Anforstan'; (2) burning of clear-felled areas and grubbing of stumps likely to interfere with mechanical cultivation; (3) manuring and heavy liming; (4) rotary cultivation, which broke up and mixed the raw humus with the mineral soil; (5) growing of field crops (rye, oats, barley, and potatoes) for two seasons, which involved a second manuring at the beginning of the second season; (6) planting of a mixed forest crop with Pine as the principal species and usually including Oak, Alder and Hornbeam; (7) for further soil improvement, introduction of perennial lupine and broom between the rows of tree seedlings in the year after these had been planted. So far the growth of the plantations established in this manner—the oldest of which are now 9 years old—has been excellent, and analyses of the soils indicate that their physical and chemical properties closely resemble those of local mull soils. The cost of the operations was covered largely by the income from field crops.

11.49. Soil Types

11.49 : 11.42 (41.1–4). MUIR, A. **Some forest soils of the north-east of Scotland and their chemical characters.** *Forestry* 14, 1940 (71–80). [Macaulay Institute for Soil Research, Aberdeen.]

A description is given of some of the soil types occurring on forest ground in this region. These include podzols, peaty podzols, peaty gleys, surface- and ground-water gley soils, and brown earths. The various kinds of chemical analyses used in studying the soils are then described and examples of the data obtained and how these are interpreted are given. *Author's summary.*

11.49 : 12.19 : 23.3 (41.1–4). MUIR, A., and FRASER, G. K. **The soils and vegetation of the Bin and Clashindarroch Forests.—With notes on afforestation by H. M. Steven.** *Trans. R. Soc. Edinb.* 60, 1939–40 (233–341).

A soil and vegetation survey has been made of an area of diverse geology in N.E. Scotland which is undergoing afforestation. Detailed descriptions of the various soil and vegetation types are given, and it is shown how these may be correlated with each other and with changes in climate, both local and regional. A short description of the current [1937] views of the choice of tree species for the various soil types concludes the report. *From authors' summary.*

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 (79 : 78) : 60.1. UNITED STATES. **Annual report of Intermountain Forest and Range Experiment Station for 1940.** Ogden, Utah. 1941. pp. 56 + ix.

Summer floods occur in this region only where the soil is relatively impervious from natural causes or as a result of misuse. Range deterioration has been found to reduce infiltration by as much as 90 per cent. and studies show that the run-off from excessively grazed areas may be as much as 150 times that from ungrazed land (p. 47).

11.62 : 38.3. FRANK, B. **Headwater highways—a new forest menace.** *J. For.* 39, 1941 (291–6). [U.S. Forest Service.]

Examples of damage, including erosion, silting and destruction of vegetation, resulting from road construction in headwater areas. The ecological background of this problem and the responsibility of the forester in the location and construction of roadways is discussed.

11.62.1 : 91.3. STEBBING, E. P. **Forests and erosion.** *Repr.* from *J. Afr. Soc., Lond.* Jan., 1941 (27–47).

A discussion of recent evidence on erosion as a result of deforestation, with special reference to tropical Africa. It is suggested that a small international committee be appointed to formulate an anti-erosion policy for this region.

11.62.11 : 01.6. MOATS, R. W. [Compiler]. **Wind erosion and sand dune control: a selected list of references.** *Soil Conservation Bibliography* No. 1, 1940. pp. 66. Soil Conservation Service, U.S.D.A., Washington, D.C.

11.62.11 : 23.2 (54.7). DHARESHWAR, S.S. **The denuded condition of the minor forest in Kanara coastal tract, its history and a scheme for its regeneration.** *Indian For.* 67, 1941 (68–81).

The scheme for regeneration includes restocking with useful fodder and timber trees by *taungya* units, the control of grazing, and protection from fire.

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.1. *Metabolism. Plant Constituents. Nutrients. Sap Flow. Transpiration*

12.11.11 : 12.14.5 : 21.8. BERTRAND, G., and SILBERSTEIN, L. Sur les variations de la teneur en bore des feuilles avec l'âge. [**On the variations of the boron content of leaves with increasing age.**] *Annales de l'Institut Pasteur* 64, 1940 (87–9). [F.] O.R.S.

Analyses of the leaves of several woody species, including *Aesculus hippocastanum*, *Sorbus aucuparia*, and *Picea abies*, taken at successive stages of development between mid-March and mid-July, showed that their boron content was generally highest either in the bud stage or a little after the buds had broken, i.e. at the time of greatest physiological activity. Except in *Aesculus hippocastanum*, the boron content declined steadily from this time onwards. The boron content of leaflets of *A. hippocastanum* declined from 9·8 mg. per kg. dry weight in the bud stage to 6·2 mg. on the 8th of April and subsequently rose gradually to 11·1 mg. by the 20th of July.

12.11.11 : 12.25 : 12.14.8 : 33.32. HAY, K. D., and LEWIS, H. F. **The chemical composition of Balsam bark.** *Paper Tr. J.* 111 (25) 1940 (39–43). [Institute of Paper Chemistry, Appleton, Wis.] P.R.

An analysis has been made of the extractives and of the extractive-free bark from Balsam [*Abies balsamea*]. Gelatinized particles have been observed on heating extractive-free bark with water. The possible relation of these particles to pitch trouble in the manufacture of paper from Balsam is discussed. *Authors' summary.*

12.11.11 : 12.25 : 12.14.8. SHARKOV, V. I., and GIRCHITS, A. L. **On the chemical composition of the bark of trees. 12. The transformation of inner into outer bark in *Pinus sylvestris*.** *Lesokhim. Prom.* 1940 (1), (14–23). [R.] L.S.

In the analyses described the transition was characterized by (1) a considerable diminution of pectin substances which was compensated by an increase of lignin substances; (2) a sharp decrease of tannins; (3) an insignificant change in the amount of cellulose and its accompanying pentosans. The lignin substances in the outer bark included non-methylated and highly methylated lignin, neither of which had been observed in the inner bark.

12.11.11 : 12.25 : 12.14.8. SHARKOV, V. I., and GIRCHITS, A. L. **On the mechanism of the formation of the tissues of the inner bark from the cambial sap of Pine.** *Lesokhim. Prom.* 1940 (3), (7–12). [R.] L.S.

The chemical composition of the sap and the tissues of the inner bark are compared. It is noted that some of the chemical processes involved in the formation of the inner bark are as yet unexplained.

12.11.11 : 12.26–8 : 34.25. HARTMANN, M., and SCHLITTLER, E. Über afrikanische Pfeilgiftpflanzen. I. *Adenium somalense* Balf. fil. [**On African arrow-poison plants. I. *Adenium somalense*.**] *Helvetica Chimica Acta* 23, 1940 (548–58). [G.g.] O.R.S.

Somalin, a new heart glucoside, was isolated from *Adenium somalense* and its molecule was found to consist of one molecule of digitoxigenin in combination with one of cymarose. The new glucoside is chemically related to digitoxin, but its pharmacological effects are closer to those of strophanthin.

12.11.11 : 12.26–8 : 34.25. FOLKERS, K., and UNNA, K. ***Erythrina* alkaloids. V: Comparative curare-like potencies of species of the genus *Erythrina*.** *J. Amer. pharm. Ass.* 28, 1939 (1019–28). Biol. Abs. 15 (2869).

12.11.11 : 12.26–8 : 34.25. FOLKERS, K., and KONIUSZY, F. ***Erythrina* alkaloids. VI: Studies on the constitution of erythramine. VII: Isolation and characterization of the new alkaloids, erythraline and erythratine. VIII: Studies on the constitution of erythramine and erythraline. IX: Isolation and characterization of erysodine, erysopine, erysocine, and erysovine.** *J. Amer. chem. Soc.* 61, 1939 (3053–5); 62, 1940 (436–41; 1673–83). Biol. Abs. 15 (2869).

12.11.11 : 12.26–8 : 12.14.8. SIMADA, H. **Constituents of the bark of *Fraxinus* species.** *Journal of the Pharmaceutical Society of Japan* 60, 1940 (200–1, 508). [Jap.e.] L.P.S.

Aesculetin, previously reported by the author from bark of *Fraxinus sieboldiana* Blume (var. *serrata* Nakai), has now been isolated from the bark of three other Japanese species, viz. *F. sambucia* Koidz., *F. pubinervis* Blume (in this instance together with a small amount of fraxetin), and *F. japonica* Blume.

12.11.12. KRAMER, P. J. **Sap pressure and exudation.** *Amer. J. Bot.* 27, 1940 (929–31). [Duke University, Durham, N.C.] O.B.D.

A study was made of the exudation of sap from freshly cut stumps and bore holes in *Acer rubrum* L., *Betula nigra* L., and *Carpinus caroliniana* Walt., to check the contention of James and Baker that sap flow does not occur from the xylem vessels. Observations were made on over 75 small trees during February and March of 3 successive years. Cups were attached to the trunks, filled with acid fuchsin solution, and holes drilled into the trunks beneath the surface of the dye. No penetration of the dye ever occurred while exudation of sap was occurring, but penetration always occurred when sap exudation ceased. In most experiments exudation ceased in the afternoon and the dye immediately penetrated the stems. Similar results were obtained from experiments in which the dye was placed in reservoirs attached to freshly cut stumps. No indication was found of the existence of sub-atmospheric pressures in xylem vessels of stumps or trunks from which exudation was occurring. Exudation clearly occurred from the xylem vessels of the woody species investigated. The contrary conclusions reached by James and Baker are probably the results of the small number of trees investigated, the fact that the species studied has a very low rate of exudation, and the use of an unsuitable technique. *From author's summary.*

12.11.12 : 12.14.2 : 12.14.7 : 12.26–8. CLEMENTS, H. F. **Movement of organic solutes in the Sausage Tree, *Kigelia africana*.** *Plant Physiol.* 15, 1940 (689–700). [University of Hawaii, Honolulu.] O.B.D.

Experiments on the growth of fruits of *Kigelia africana* gave results highly unfavourable to the mass flow hypothesis of sugar translocation in the phloem. The greatest transport of materials into the fruit occurred in the first 5 weeks of growth, thus disagreeing with the concept of a passive sieve-tube cytoplasm. The total sugar content of the phloem was found to be 1·75 per cent., instead of at least 10 per cent. as assumed in the hypothesis, and at such a concentration the observed delivery of sugars to the fruit would necessitate a speed of solution movement far beyond the capacity of even the xylem tissues. No return of water from the fruit through the xylem could be detected. The observed movement of sugar into the fruit was so great that it is considered necessary to explain it as a function of the living sieve-tube cytoplasm.

12.11.14 : 12.25 : 12.14.1. BAKER, F. S. **Density of cell sap in Redwood.** *Ecology* 22, 1941 (84–5). [University of California, Berkeley.]

Determinations were made of the osmotic concentration of the cell sap and the water content of leaves taken at various heights from a 243-ft. tree of *Sequoia sempervirens*. Within the crown there was no significant correlation between water content of the leaves and height, but a general tendency was found for osmotic concentration to increase with height, the average rate being equivalent to 1 atmosphere per 35·7 ft. This value is scarcely higher than that for hydrostatic pressure, and much lower than that postulated by various authorities on theoretical grounds. The leaf samples, however, were taken in dense fog, so that water absorption may have obscured the normal osmotic relationships.

12.11.2. *Propagation. Growth. Development*

12.11.21 : 12.25 : 23.23. SMITH, C. O. **Observations on the germination of *Araucaria bidwillii*.** *Amer. Nat.* 75, 1941 (96). [Citrus Exp. Sta., University of California, Riverside.] L.S.

In *Araucaria bidwillii* the cotyledons are surrounded by food tissue that can apparently nourish the young plant for months while its root system is becoming established. When germinating, the seed develops an enlarged fusiform radicle from which the true leaves later appear. The seed and the fusiform radicle have an intermediate tissue that soon decays and leaves the remains of the seed separated from the plant. Three plants from which the seeds were accidently broken off grew and formed true leaves much sooner than others with the seed attached. The latter developed a root system, but the seed shells were still in place, though empty, one year after planting. A growth of 1–2 in. took place within the shells and rudimentary leaves were formed. The seedlings from which the seeds had been broken off, on the other hand, were well branched, leafy, and about 8 in. high.

12.11.22 : 12.11.15. TINCKER, M. A. H. **Application of plant growth substances in practice.** [A review.] *Nature, Lond.* 147, 1941 (439–42). [Royal Horticultural Society's Laboratories, Wisley.]

12.11.22 : 12.25 : 12.11.15. FARRAR, J. L., and GRACE, N. H. **Note on the propagation by cuttings of White Pine and White Spruce.** *Canad. J. Res.* 18, Sec. C, 1940 (612). Repr. *N.R.C.* No. 962. [National Research Laboratories, Ottawa.]

On the average White Spruce rooted 80–90 per cent. and White Pine 50–60 per cent. under optimum conditions, which consisted primarily in a propagation medium of a peat-and-sand mixture, the peat being well decomposed and of sedge origin, and secondly in the collection of White Spruce cuttings in late July and those of White Pine in mid-August.

12.11.22 : 12.25 : 12.11.15. GRACE, N. H., and FARRAR, J. L. **Vegetative propagation of conifers. VIII. Effects of media and phytohormone dust treatments on the rooting of Norway Spruce cuttings.** *Canad. J. Res.* 18, Sec. C, 1940 (591–8). Repr. *N.R.C.* No. 957. [National Research Laboratories, Ottawa.]

Dormant Norway Spruce cuttings collected in November were treated with talc dusts containing indolylacetic acid, planted in five media including two different sands and mixtures of these with peat humus, and propagated in a greenhouse. While 1,000 p.p.m. indolylacetic acid treatment increased survival in sand and there were interactions between media and phytohormone treatment, the marked differences between the various media were the striking feature of the results. Mixtures of peat humus with sand were uniformly superior to sand only. There were also some differences between a fine and a coarse sand, when used either alone or in combination with peat. It may accordingly be concluded that selection of a suitable medium is of great importance in the propagation of Norway Spruce cuttings. *Authors' summary.*

12.11.22 : 12.25. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Preliminary tests on the propagation of *Pinus insignis* from cuttings have given promising results in the winter rainfall area of Tokai (p. 23).

12.11.22 : 12.25 : 11.43.1. SNOW, A. G. **White Pine propagation.** *J. For.* 39, 1941 (332–3). [Northeastern Forest Exp. Sta.]

In a number of cases the successful propagation of White Pine cuttings has been obtained in rooting media previously used for coniferous material and infected with species of fungi, which, it is suggested, may benefit the propagation of the cuttings either by supplementing the supply of natural auxins or in a symbiotic relationship.

12.11.22 : 12.25 : 12.11.15. SNOW, A. G. **Rooting White Pine cuttings.** *Occ. Pap. Ntheast. For. Exp. Sta.* No. 11, 1940. pp. 6.

In experiments with 4-in. greenwood cuttings of White Pine of different ages, collected in late July and early August and treated with indolebutyric and naphthaleneacetic acids in agricultural clay in proportion of 1 : 2,000 and 1 : 10,000, the following results were obtained: (*a*) The highest percentage rooting was given by cuttings from trees up to 5 years old. (*b*) Best rooting response was obtained from lateral segments of current season's growth on lateral branches in the lower portion of the tree. (*c*) The phytohormone treatment giving maximum average rooting was indolebutyric acid at concentration of 25 mg./l. for 6 hours followed by dipping in auxin dust. (*d*) A propagating bed covered with a sash at night and containing decomposed horse manure and bedding straw under 6 in. of 3 : 2 sand/peat mixture resulted in more cuttings rooted than the sand/peat mixture alone in an open type bed covered with burlap.

12.11.22 : 12.25 : 12.11.15. GRACE, N. H., and FARRAR, J. L. **Effects of talc dusts containing phytohormone, nutrient salts, and an organic mercurial disinfectant on the rooting of dormant *Taxus* cuttings.** *Canad. J. Res.* 19, Sec. C, 1941 (21–6). [National Research Laboratories, Ottawa.] P.R.

Dormant *Taxus cuspidata* cuttings were treated with talc dusts containing 1- and 2-γ naphthylbutyric acid at concentrations of 0, 500, 1,000, and 2,000 p.p.m., each taken separately and in combination with 0, 0·1, 1, and 10 per cent. of a mixture of nutrient salts and 0 and 50 p.p.m. of ethyl mercuric bromide. Data on the number of rooted cuttings failed to disclose any significant treatment effects. However, the number and length of roots per rooted cutting were increased by the phytohormone in all concentrations, the effect increasing with ascending concentration. Data for most of the other criteria indicated injurious effects from the phytohormone. The average length of new growth was increased by both the 1 and 10 per cent. concentrations of nutrient salt in

the presence, but not in the absence, of 1,000 p.p.m. of the phytohormone. The 10 per cent. concentration of nutrient salts decreased the number of cuttings with new growth and the number of such cuttings that were rooted. Organic mercury treatment failed to have any significant effects. *Authors' summary.*

12.11.22 : 12.26–8 : 12.11.15. JENSEN, H. Ett försök med vegetativ förökning av björk m. m. **[An experiment on the vegetative propagation of Birch and other trees.]** *Svensk PappTidn.* 43, 1940 (286–7). [Sw.] [Ramlösa Plantskola, Hälsingborg.] L.S.

In the spring of 1938 several Birch trees were cut close to the ground and the surface of the stumps coated with paraffin wax to prevent bleeding or drying out. The stool shoots that developed during the summer, reaching a height of 0·5–1 m. and a basal diameter of 5–10 mm., were left alone till the following spring. Just before leafing a ring of thin copper wire was fixed round each shoot as near as possible to its base, and the shoots were thinly smeared at and to 5 cm. above the wire with a paste containing 2·5 g. of hetero-auxin to 100 g. of lanolin. The whole stump was then covered with good, porous compost made from hardwood leafmould, the base of the shoots being buried about 15 cm. deep. The heap was watered only in drought periods. In spite of the constricting wire, which was soon completely overgrown with callus, the shoots grew vigorously until late in the summer, when practically all of them had formed a strong, bushy root system. Plants thus raised were too big and too few for forest planting, and experiments are in progress to determine the best means of mass propagation. In view of its expensiveness the method will be suitable only for the production of selected strains and the elite crops thus formed will have to be interplanted with cheap Birch seedlings which can be removed during thinnings. The method was also successfully employed for inducing a grafted giant Aspen to develop roots for use in chromosome studies.

12.11.23 : 12.11.15. THIMANN, K. V. **The hormone control of plant development.** *Amer. Nat.* 75, 1941 (147–53). [Harvard University.] L.S.

A brief, general statement of present knowledge of the physiological role of auxins in controlling growth.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3. DERMEN, H. **Colchicine polyploidy and technique** [a review]. *Bot. Rev.* 6, 1940 (599–635). [U.S. Horticultural Station, Beltsville, Md.]

12.11.3 : 12.25. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939-40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

Provenance studies made in Welsh forests indicate that European Larch from Scottish seed is definitely superior to that from most European races (p. 6).

12.11.3 : 12.25 : 21.61 : 56 : 33.32. Föreningen för växtförädling av skogsträd. **[The Swedish Forest Tree Breeding Association (report on 1940 annual meeting).]** *Svensk PappTidn.* 43, 1940 (90–2). [Sw.] L.S.

This report includes a summary by Dr. Nils Sylvén of the work of the Swedish Forest Tree Breeding Association during 1939, of which the chief features are:—(i) An account of photoperiodism in Aspen [cf. *For. Abs.* 3 (39)]. (ii) A study of the branch habit of Norway Spruce in relation to increment and pulping properties. For the increment study 13 sample plots were chosen in well-managed, even-aged, 50- to 70-year-old plantations of varied provenance and having a high proportion of 'comb Spruce', a type in which the main side branches have a comb-like fringe of drooping twigs. Previous observations indicating the superiority of this type were confirmed, the 'comb Spruce' showing better growth than other types in all the sample plots. In one stand the average diameter of 'comb Spruce' was 8·67 cm. above that of non-comb types, and in another stand its average height exceeded that of other types by 6·09 m. Pulping experiments with the wood of 'comb', 'brush', and 'band' Spruce types, conducted in parallel at the laboratories of two industrial firms and at the Association's own laboratory, showed that the woods of the 3 types did not differ significantly in specific gravity or in the properties and yield of sulphite pulp obtainable from them. Determinations were also made at the Association's laboratory of the cellulose, lignin, and resin contents of wood from a further series of trees representing 5 branch types. In this work it

was again found that the average composition of the woods was comparatively uniform, though the lignin content of the 'irregular comb' type was 0·7–0·9 per cent. lower, and that of the 'plane' type 0·8–1·0 per cent. higher than that of the 'pure comb', 'brush', 'brush-comb', and 'band' types. The wood from individual trees of the same type varied enough to warrant further investigation, which is now in progress.

12.11.3 : 12.25 (941). PERRY, D. H. ***Pinus pinaster* in Western Australia. (Some notes on the varieties and geographical races of *Pinus pinaster* established in Western Australia).** *Aust. For.* 5, 1940 (85–7).

During the past 20 years considerable attention has been given to the establishment of this tree on the coastal sand plain of Western Australia. The four races recognized there are (1) Landes (French Atlantic coast), (2) Portuguese (forests of Leiria and Marinha Grande), (3) Corsican, and (4) Esterel (Esterel and Var regions in Southern France or Lucca in Northern Italy). Under Western Australian conditions the Portuguese strain is faster-growing than any of the others, exhibits particularly good form, and is now being planted almost exclusively. The strain designated as Esterel has not only a very slow rate of growth but also a poor form, and should not be used.

12.11.3 : 12.25 : 12.11.21. DUFFIELD, J. W., and SNOW, A. G. **Pollen longevity of *Pinus strobus* and *Pinus resinosa* as controlled by humidity and temperature.** *Repr.* from *Amer. J. Bot.* 28, 1941 (175–7). [North-eastern Forest Exp. Sta.]

The results of a 1-year storage experiment showed that at a relative humidity of 50 per cent. and temperatures of 0°–4° C. pollen of *Pinus strobus* and *P. resinosa* was still more than 80 per cent. germinable, with no significant difference between the pollen of the two species. Germinability was reduced practically to zero at relative humidities of 0 per cent. and 10 per cent., regardless of temperature; this was also true at room temperature and 30° C., regardless of humidity. Germinability of pollen stored at low humidities was increased by humidification at 75 per cent. relative humidity and 4° C. for 12 hours. *From authors' summary.*

12.11.3 : 12.25. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Pinus taeda grown from seed collected at the southern border of its natural habitat showed better growth than that from seed collected from strains further north or west (p. 22).

12.11.3 : 12.26–8 : 12.11.22. JOHNSSON, H., and EKLUNDH, C. Colchicinbehandling som metod vid växtförädling av lövträd. **[Colchicine treatment as a method in breeding hardwood species.]** *Svensk PappTidn.* 43, 1940 (373–7). [Sw.e.] L.S.

An account is given of the experimental methods used in and the results obtained from various colchicine treatments of seeds of *Populus tremula*, *Betula verrucosa*, *B. pubescens*, and *Quercus robur*, young plants of *Q. robur*, and cuttings of *P. tremula*. Chromosome numbers are given for the seedlings raised from treated seed. Most of the plants had normal diploid cells in the root tips, a few had only tetraploid cells, and the remainder were mixoploid, with both diploid and tetraploid cells in the same root or in different roots of the same plant. The roots and stems were usually swollen, the leaves thicker and darker green, and the whole development practically arrested after colchicine treatment of the plant. Measurements of stoma length are given for treated plants of *P. tremula* and *Q. robur*. Stoma length was found to be fairly independent of the chromosome number of the root-tip cells, and plants often had tetraploid roots with diploid shoots or *vice versa*. Giant, unreduced pollen grains were found in the catkins of colchicine-treated cuttings of *P. tremula*, but the treatment checked further development of the anthers, so that the pollen could never be of any use.

The following general conclusions are drawn regarding the use of colchicine in breeding work with hardwood species:—(i) The development of tetraploid tissue can always be induced by treating germinating seed or other growing points with colchicine. (ii) The effective colchicine concentration is so high that it has a lethal or at least temporarily weakening effect, rendering difficult the future cultivation of the treated plant. (iii) The plants or plant organs developed after the treatment are not uniform but mosaics consisting of polyploid and diploid tissues in varying proportions. (iv) To utilize such mixoploids in breeding work it is essential to secure prompt isolation, by bud-grafting, root cuttings, or the like, of the greatest

possible number of growing points from each mixoploid plant, and to examine the chromosome number of every single plant so obtained. [*From second instalment and authors' summary: first instalment not available for abstracting.*]

12.11.3 : 12.26–8. YABLOKOV, A. S. **On the heterogeneity of the F_1 generation of interspecific hybrids of forest trees.** *Yarovizatsiya* 1940 [4 (31)], (33–40). [R.] A.P.B.

Six-year-old hybrids of *Juglans mandshurica*♀ × *sieboldiana*♂ having identical parents exhibited marked similarity in vigour, habit of growth, length of vegetational period, and flowers, when obtained from seed of the same fruit cluster, while hybrids from seed of two different fruit clusters often differed in the above respects, resembling more closely either the maternal or the paternal tree. Such differences between hybrids of identical parentage but from seed of different fruit clusters are thought to be due to differences in the predominance of the hereditary constitution of the maternal tree, and have also been observed by the author in a number of Poplar hybrids, including *P. tremula*♀ × *bachofenii* var. *pyramidalis*♂, *P. alba*♀ × *bachofenii* var. *pyramidalis*♂, *P. nigra* var. *pyramidalis*♀ × *nigra*♂, and *P. tremula*♀ × *nigra* var. *pyramidalis*♂.

12.11.3 : 12.26–8. FREEMAN, O. M. **A Red Maple, Silver Maple hybrid.** *J. Hered.* 32, 1941 (11–4). [Bureau of Plant Industry, U.S.D.A.] O.R.S.

From an artificial crossing made in 1933 between *Acer rubrum* and *A. saccharinum*, the former being the mother tree, 41 seedlings were raised. These vary widely in leaf shape, habit, and rate of growth. One seedling has a columnar habit and may be useful as an ornamental tree, particularly as it has proved easy to propagate from greenwood cuttings.

12.11.3 : 12.26–8. DUFFIELD, J. W. **Chromosome counts in *Quercus*.** *Repr.* from *Amer. J. Bot.* 27, 1940 (787–8). [Northeastern Forest Exp. Sta.]

The somatic chromosome number of 19 species of *Quercus* was determined as 24. Suggestions that 6 is the basic number in the genus *Quercus* are discussed. All the evidence at hand still supports the claim that *Quercus* is a homoploid genus. *From author's summary.*

12.11.3 : 12.26–8. HERSHEY, J. W. **Progress report in the forest tree strain selection work using William Penn Oaks and Walnuts for experiments.** *For. Leaves* 31, 1941 (3, 15–6).

A key has been compiled for use in selecting superior strains, based on timber type, seedling vigour, and acorn flavour. Classification, according to this key, is given for 18 selected William Penn White Oak veterans and one Burr Oak that are available for research work.

12.12. Teratology

12.12 : 12.25. Kottesjuka på tall. [**Cone 'disease' on Scots Pine.**] *Skogsägaren* 17, 1941 (19). [Sw.]

Abnormal cone production is reported for a 22-year-old Scots Pine at Knaggebo, Bjurbäck, in Västergötland. The peculiarity consists in a dense clustered growth of cones just below the whorls of branchlets, the cluster on the leader containing 36 cones and those on side branches 11–18 cones. The leader appears to be stunted in consequence of cone production, and the tree is only about two-thirds as high as the rest of the stand. The cones are of normal size and well developed, though some show unusually long peduncles. The seeds are small but appear normal otherwise. In view of the possibility that the condition might be hereditary, seed has been sent to the Swedish Forest Tree Breeding Association.

12.13. Embryology

12.13. WEBBER, J. M. **Polyembryony** [a review]. *Bot. Rev.* 6, 1940 (575–98). [U.S.D.A.]

12.13 : 12.25. BUTTS, D., and BUCHHOLZ, J. T. **Cotyledon numbers in conifers.** *Trans. Ill. Acad. Sci.* 33 (2), 1940 (58–62). N.H.M.

New data and past records are listed by genera and species. The family Pinaceae shows the greatest number and greatest variability recorded, and the genera *Cedrus* and *Pinus* have the largest mean number of cotyledons.

12.13 : 12.25. BUCHHOLZ, J. T. **The embryogeny of *Cunninghamia*.** *Amer. J. Bot.* 27, 1940 (877–83). [University of Illinois, Urbana.] O.B.D.

The embryogeny of *Cunninghamia lanceolata*, which is described and illustrated in detail, shows that the genus stands closest to *Taxodium* and *Cryptomeria*. It is suggested that Pilger's grouping of the subfamily Taxodioideae should be modified so as to place *Cunninghamia* and possibly *Taiwania* in a sub-group most closely related to a similar sub-group consisting of *Cryptomeria*, *Taxodium* and possibly *Glyptostrobus*. The *Sequoia* group, consisting of *Sequoiadendron*, *Athrotaxis*, and *Sequoia*, should be segregated as a distinct sub-family, the Sequoideae.

12.13 : 12.25. BUCHHOLZ, J. T. **The embryogeny of *Torreya*, with a note on *Austrotaxus*.** *Bull. Torrey bot. Cl.* 67, 1940 (731–54). [University of Illinois, Urbana.] O.B.D.

A detailed description is given of the embryogeny of the three species of *Torreya*, together with some observations on the embryo of *Austrotaxus spicata*. It is concluded that *Torreya* occupies an advanced position in the phylogeny of the conifers and that the order of the species, in increasing degrees of specialization, is: *T. nucifera*, *T. californica*, and *T. taxifolia*. The author agrees with Saxton's views on the probable phylogeny of the Taxaceae.

12.13 : 12.25. JOHNSTONE, G. R. **Further studies on polyembryony and germination of polyembryonic Pine seeds.** *Amer. J. Bot.* 27, 1940 (808–11). [University of Southern California, Los Angeles.] O.B.D.

Multiple seedlings have been reported in 11 species of *Pinus*: *P. cembroides* var. *monophylla*, *P. coulteri*, *P. jeffreyi*, *P. lambertiana*, *P. monticola*, *P. muricata*, *P. pinaster*, *P. sabiniana*, *P. strobus*, *P. thunbergii*, and *P. torreyana*. The selective development of one embryo at the expense of the other or others, which usually occurs with polyembryonic seeds, was observed in the present study to continue even after germination in 60 per cent. of such seeds. The phenomenon of multiple seedlings has been most frequent in *P. monticola* and least so in *P. muricata*, and it is noteworthy that 5 of the 11 species in which the phenomenon has been reported are among the 4- to 5-needled Pines. [Cf. *For. Abs.* 2 (288) for further species of *Pinus* in which multiple seedlings have been noted.]

12.14. Organography. Morphology. Anatomy. Histology

12.14.3 : 12.25 : 21.6. ADAMS, A. J. S. **Observations on root fusions in Monterey Pine.** *Aust. For.* 5, 1940 (78–80).

12.14.3 : 12.26–8 : 11.48 : 12.19.2. YURKEVICH, I. D. **The development of the root system of *Euonymus verrucosa* L. as dependent upon soil conditions and forest type.** *Bot. Zh.* 25, 1940 (131–8). [R.e.] A.P.B.

The investigations described were carried out on 340 sample shrubs, mostly 18 to 19 years old, in various forest types of the White-Russian Soviet Republic. The shrubs were of both vegetative and seed origin. The density of the forests was ·7 to ·8. In all cases over 90 per cent. of the roots by weight were found in the A_1 horizon within 10 cm. of the soil surface. In the sandy soils the roots spread considerably, were relatively heavy, and the compactness of the root system was low. The reverse was observed in the case of soils with a high clay content. Details of the development of the root system in relation to forest type and soil conditions are shown in the table below.

	A horizon			*Root system (averages calculated per unit shrub)*						
						Compactness				
Forest type	*Clay in per cent.*	*Humus in per cent.*	*Projection area in sq. cm.*	*Total length of roots in cm.*	*Total weight in g.*	*Root length in cm. per 1 square decimetre of root system*	*Same, in per cent. of average*	*Root weight in g. per 1 square decimetre of root system*	*Same, in per cent. of average*	*Root weight in g. per 1 m. of length of root*
Pinetum quercetosum	4·48	0·41	53,376	866·5	596·5	1·6	28·6	1·1	57·8	68·8
Quercetum carpineto-pteridiosum	7·76	0·52	33,046	691·2	299·4	2·1	37·5	0·9	47·3	43·7
Quercetum carpineto-aegopodiosum	14·03	1·08	10,533	592·5	342·1	4·4	78·6	2·5	131·5	57·9
Quercetum carpineto-fraxinosum	26·20	4·71	14,968	1202·8	418·3	8·0	142·8	2·8	147·3	34·8
Quercetum piceeto-carpineto-oxalidosum	24·23	1·28	10,151	623·0	174·4	6·1	108·9	1·7	89·5	28·1
Quercetum piceeto-carpineto-aegopodiosum	15·92	3·26	21,121	1279·2	346·0	6·0	107·1	1·6	84·2	27·0
Piceetum oxalidosum	40·16	4·66	14,448	1077·0	380·0	7·5	133·9	2·6	136·8	35·3
Piceetum corylosum	34·24	4·81	6,338	661·7	184·3	10·4	185·7	2·9	152·6	27·9
Pinetum piceeto-corylosum	17·19	3·78	21,871	978·7	271·3	4·5	80·3	1·2	63·2	27·7
Averages	—	—	20,984	885·8	334·7	5·6	—	1·9	—	—

12.14.4 : 12.26–8 : 31.1. BAILEY, I. W., and HOWARD, R. A. **The comparative morphology of the Icacinaceae. I. Anatomy of the node and internode.** *J. Arnold Arbor.* 22, 1941 (125–32). [Biological Laboratories, Harvard University.]

12.14.5 : 12.26–8. BAYLIS, G. T. S. **Leaf anatomy of the New Zealand Mangrove.** *Trans. R. Soc. N.Z.* 70, 1940 (164–70). L.S.

A detailed account is given of the leaf anatomy of the sole Mangrove species that occurs in New Zealand. The species has hitherto been identified as *Avicennia officinalis*, but its leaf anatomy does not completely agree with that of *A. officinalis* as described by workers in other countries, and thus some doubt is thrown upon its exact identity.

12.14.7 : 12.25 : 09.2. CRANWELL, L. M. **Pollen grains of the New Zealand conifers.** *N.Z. J. Sci. Tech.* 22, 1940 (1B–17B). [Auckland Institute and Museum.] P.R.

The pollen grains of the 5 New Zealand genera [*Phyllocladus*, *Dacrydium*, *Podocarpus*, *Libocedrus*, and *Agathis*] are described and figured so that it should be possible to recognize the majority with confidence when they are found in peats or are caught on atmospheric slides. The observations support the groupings of Pilger except for 3 species of *Dacrydium* (*colensoi*, *intermedium*, and *laxifolium*), which are quite aberrant, as they share *Podocarpus* characteristics. The claim of Sahni and Mitra (based on studies of female flowers alone) that *D. bidwillii*, and possibly *biforme* and *kirkii*, should be included in *Podocarpus* finds no support in the study of their pollen grains. *From author's summary.*

12.14.7 : 12.25. STOCKWELL, W. P. **Cone variation in Digger Pine.** *Madroño* 5, 1939 (72–3). K.

Cones of *Pinus sabiniana* vary in form and size from large with long hooked spurs, resembling those of *P. coulteri*, in central and northern California, to short, broad-based and woody with scales having short, heavy spines, resembling those of *P. torreyana*, in the southern part of its range.

12.14.7 : 12.26–8. MANNING, W. E. **The morphology of the flowers of the Juglandaceae. II. The pistillate flowers and fruit.** *Amer. J. Bot.* 27, 1940 (839–52). [Smith College, Northampton, Mass.] O.B.D.

The pistillate flowers and fruit of all 6 genera of the Juglandaceae are described and figured, and several important variations are noted. The floral structure of the pre-Juglandaceae is suggested, and the primitive and advanced features of each of the modern genera are emphasized. *From author's summary.*

12.14.7 : 12.26–8 : 12.11.3. AL'BENSKI, A. V. **The transformation of Aspen from a dioecious into a monoecious plant.** *Dokl. vsesoyuz. Akad. s.-kh. Nauk* 1940 (19), (27–9). [R.] A.P.B.

The writer records one collection of hermaphrodite flowers from an Aspen, although such flowers were not found on the tree in the following years. In crossing Aspen and White Poplar, both dioecious and monoecious hybrids were obtained. The latter had male, female, and mixed catkins. These phenomena are as yet unexplained.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 (75.6 : 76.8). BROWN, D. M. **Vegetation of Roan Mountain: a phytosociological and successional study.** *Ecol. Monogr.* 11, 1941 (61–97). [State Teachers College, Johnson City, Tennessee.]

The forest communities of Roan Mountain, on the boundary of Tennessee and North Carolina, are :—(i) The Beech/Maple community, which occurs at 3,500–5,500 ft. and has a top storey of *Fagus grandifolia*, *Acer saccharum*, *Betula lutea*, *Aesculus octandra*, and *Amelanchier laevis*, a second storey of *Acer spicatum* and *A. pennsylvanicum*, a shrub layer chiefly of *Viburnum alnifolium*, *Rubus canadensis*, and *Ribes rotundifolium*, a herb layer dominated by *Eupatorium roanensis*, *Impatiens biflora*, and *Dryopteris dilatata*, and a light ground layer of mosses and lichens. It appears to be an old and well stabilized climax, except in certain places along its upper margin, where the Spruce/Fir appears to be gradually replacing *Betula lutea*. (ii) The Spruce/Fir community, which occurs above 5,500 ft. and is dominated by *Picea rubra* and *Abies fraseri* with the addition of *Betula lutea* at higher altitudes, less frequent species in the tree layer being *Acer spicatum*, *Sorbus americana*, *Aesculus octandra*, and *Prunus pennsylvanica*. The shrub layer is composed chiefly of *Vaccinium erythrocarpum*, *Viburnum alnifolium*, and *Rhododendron catawbiense*; the herb layer is dominated by *Dryopteris dilatata* and *Oxalis*

acetosella; and the ground layer is heavily carpeted by mosses. This community is the climax for most of the area above 5,500 ft.

From 5,500 ft. to the summit grassland communities, including shrub 'balds', also occur. The flora, origin, and place in succession of the 'balds' is discussed in some detail. It is concluded that they are of natural origin and were once more extensive, being at present in process of invasion by the Spruce/Fir community, which seems likely to replace them in the course of time. Climatic change in favour of tree regeneration is advanced as a possible reason for this trend.

12.19 (76.2) : 13.15. PESSIN, L. J., and BURLEIGH, T. D. **Notes on the forest biology of Horn Island, Mississippi.** *Ecology* 22, 1941 (70–8). [Southern Forest Exp. Sta.]

The forest vegetation is composed principally of Slash Pine (*Pinus caribaea*), which dominates the island and occurs in various stages of development, from seedlings of the current seed crop to trees over 20 in. in diameter at breast height. Of particular interest is the extremely small number of Oaks or other hardwoods. The Pine stands have developed in depressions, which run parallel to the shore. Several stages in their development can be recognized, beginning with the sedges and rushes in the poorly drained depressions near the shore. Notwithstanding the action of sand dunes, which in places have buried the Pine trunks to a depth of 40 ft. or more, the growth of the Pines and their capacity to bear cones have not been visibly impaired. The absence of birds that prefer Pine seeds for their food may be responsible for the excellent Pine reproduction. *From authors' summary.*

12.19 (77.5) : 11.49.5. FROLIK, A. L. **Vegetation on the peat lands of Dane County, Wisconsin.** *Ecol. Monogr.* 11, 1941 (117–140). [University of Nebraska.]

The peat lands of Dane County, Wisconsin, occupy 52,288 acres, or 6·8 per cent. of the total county area. At the time of settlement the two chief vegetation types appear to have been the *Larix* (*laricina*) consocies and the *Calamagrostis/Carex* associes. The primary plant successions have been the bog sere, terminating through a bog-shrub stage followed by the *Larix* consocies in the subclimax *Populus/Salix* associes, and the hydrosere, terminating through a shrubby *Salix/Cornus* associes in the same subclimax. The whole succession should presumably lead to a climax *Quercus/Carya* association, but no reliable evidence of the true climax is available. The *Larix* consocies is quasi-stable. Much of the vegetation is now undergoing secondary succession due to biotic factors including artificial drainage (40 per cent. of the peat land having been drained by 1926), cutting and grubbing of woody species, mowing, grazing, burning and accompanying soil disturbances. The *Larix* consocies has been most tolerant of the environmental changes and still occupies a small acreage. The course of the secondary successions from the two main vegetation types is discussed at length and suggestions are made on the economically desirable ecological treatment of the various stages, particularly with regard to pasturage.

12.19 (88.1). DAVIS, T. A. W. **On the island origin of the endemic trees of the British Guiana peneplain.** *J. Ecol.* 29, 1941 (1–13).

A brief account is given of the situation, topography, and climate of British Guiana, the chief climatic and edaphic associations are described, and the geology and geological history of the country are discussed in relation to the origin of endemic tree species. It is concluded that the endemic trees of the peneplain originated where they are found to-day, surviving the last period of land subsidence on volcanic islands now represented by hills, from which they recolonized the plain after elevation to its present level. There is not enough evidence to decide whether they were evolved on the plain itself before the last period of subsidence, or on the hills when they were islands during some earlier epoch, but the latter view is favoured.

12.19 : 12.26–8 : 21.2. STEVENS, W. C., and DILL, F. E. ***Quercus macrocarpa* in Kansas.** *Trans. Kans. Acad. Sci.* 43, 1940 (185–97). N.H.M.

Burr Oak is concentrated largely in the north-east half of the State. Precipitation, evaporation, topography, and soil characters all influence this distribution. The species is extremely drought-resistant and is concluded to be the most xerophytic of all Oaks in Kansas. Leaf structure, early and strong tap-root development, endurance of permanent wilting and other factors contribute to this quality. The heavy acorns are not readily transported and it is difficult for this species to invade new areas.

12.19 : 12.26–8. DAVIS, J. H. **Vivipary and dispersal of Mangrove seeds.** *Abstract* in *Journal of the Tennessee Academy of Science* 15, 1940 (414–5). L.S.

Studies of the direction and rate of dispersal of *Rhizophora* seedlings between Key West and the Dry Tortugas showed the probability that they can migrate to great distances at a fairly rapid rate; and studies of the method of floating and duration in sea water indicate that they can endure long journeys and establish themselves readily if they land upon a soil suitable for anchorage and growth.

12.19 : 12.26–8 (75.9). DAVIS, J. H. **The ecology and geologic rôle of Mangroves in Florida.** *Publ. Carnegie Inst. Wash.* No. 517, 1940 (303–412); *Pap. Tortugas Lab.* No. 32. Biol. Abs. 15 (1911).

12.19.1. *Regional Floras*

12.19.1 (67.8). HORA, F. B., and GREENWAY, P. J. **Check-lists of the forest trees and shrubs of the British Empire. No. 5. Tanganyika Territory. Part I.** Imperial Forestry Institute, Oxford. 1940. pp. 312.

A botanical-vernacular and vernacular-botanical list of the trees and shrubs of Tanganyika Territory. The second part, which is to be issued later, will comprise an annotated check list, including descriptive and ecological field notes.

12.19.1 (729.1) : 12.25. CARABIA, J. P. Contribuciones al estudio de la flora cubana. Gymnospermae. **[Contributions to the study of the flora of Cuba. Gymnospermae.]** *Carib. For.* 2, 1940–41 (83–99). [Span.] [Colegio de La Salle, Habana, Cuba.]

12.19.1 (729.3) : 31.0. SCHIFFINO, J. Riqueza forestal Dominicana. **[Dominican forest wealth.]** Ciudad Trujillo. 2nd ed., 1937. pp. 111. Biol. Abs. 15 (6236).

Notes on principal trees and their woods.

12.19.1 (729.9). MONACHINO, J. **A check-list of the Spermatophytes of St. Bartholomew. Part II.** *Carib. For.* 2, 1940–41 (49–66).

12.19.1 (75.9). SNYDER, E. **Florida trees. A practical handbook for the identification of Florida's trees and palms.** Geddes Printing House, Fort Myers, Fla. 1940. pp. 150. Biol. Abs. 15 (5452).

12.19.1 (79.4) : 12.19.2 : 12.19.3. COOKE, W. B. **Flora of Mount Shasta.** *Amer. Midl. Nat.* 23, 1940 (497–572). L.S.

Keys are provided to the families, genera, and species, preceded by a general account of the region and its life zones.

12.19.1 (79.4) : 12.25. WIGGINS, I. L. **Yellow Pines and other conifers observed in Lower California.** *J. N.Y. bot. Gard.* 41, 1940 (267–9). [Stanford University.]

Notes on characteristics and range in California of *Pinus ponderosa* and *P. jeffreyi*, *P. quadrifolia*, *P. monophylla*, *Libocedrus decurrens*, and *Juniperus californica*.

12.19.1 (87). PITTIER, H. Genera plantarum venezuelensium. Clave analitica de los generos de plantas hasta hoy conocidos en Venezuela. **[Analytical key to genera of plants known up to the present in Venezuela.]** Caracas. 1939. pp. 354. Biol. Abs. 15 (5428).

12.19.1 (943) : 12.19.2. FRANCIS, W. D. **Field notes on some rain forests and rain-forest trees of tropical Queensland.** *Pamphl. Dep. Agric. Stk. Qd.* No. 60, 1939. pp. 30. [*Repr.* from *Qd. agric. J.* March, 1939.]

12.19.2. *Forest Types*

12.19.2 (44). LEMME, G. Recherches écologiques sur la végétation du Perche. Localisation topographique et organisation floristique des associations silvatiques mésophiles. **[Ecological research on the vegetation of the Perche. Topography and floristic structure of the mesophytic forest types.]** *Rev. Gen. Bot.* 51, 1939 (103–26, 162–91, 229–51, 301–19, 369–84). [F.] Biol. Abs. 15 (93).

12.19.2 (497.1) : 12.19.1. PETRAČIĆ, A. Šumarsko-dendrološke bilješke iz podrucja Malinska-Glavotok na otoku Krku. **[Forestry and dendrological notes on the Malinska-Glavotok region of the island of Krk.]** *Šumarski List* 65, 1941 (1–7). [Croat.f.] L.S.

12.19.2 (67.8) : 12.19.4 : 55. GLOVER, P. E. **A preliminary report on the comparative ages of some important East African trees in relation to their habitats.** *South African Journal of Science* 36, 1939 (316–27). [Tsetse Research Station, New Shinyanga, Tang. Terr.] L.S.

A general description is given of the Kakoma district, Tanganyika Territory, with notes on its ecology, including that of woodland types.

The possible course of primary succession is outlined. Secondary succession is discussed and abundance of *Hyparrhenia* grasses is said to be a good indicator of secondary communities. Data are recorded for the diameter and age of a number of trees of various species growing in secondary communities, and it is suggested that age/girth curves, constructed from measurements of sample trees, might prove useful in determining the approximate age of dominant trees in different ecological communities.

12.19.2 (69) : 12.19.4. VAUGHAN, R. E., and WIEHE, P. O. **Studies on the vegetation of Mauritius. III. The structure and development of the upland climax forest.** *J. Ecol.* 29, 1941 (127–60). [Royal College, Mauritius.]

A study of the structure, stratification and floristic composition, and successional relationships of the upland climax forest of Mauritius, which is now reduced to an area of about 18 sq. km. in isolated blocks. Comparisons are made of the general structure of the forest with tropical forests in British Guiana, Sarawak, and Southern Nigeria. The formation appears to be most nearly related to the 'Tropical Lower-Montane Evergreen Rain-forest' of Burtt Davy.

12.19.2 (76.3). PENFOUND, W. T., and HOWARD, J. A. **A phytosociological study of an evergreen Oak forest in the vicinity of New Orleans, Louisiana.** *Amer. Midl. Nat.* 23, 1940 (165–74). [Tulane University, New Orleans.] L.S.

The evergreen Oak forest is characteristic of alluvial ridges in the vicinity of New Orleans. The forest studied was young (50 years) with a crown cover of about 55 per cent., and basal area of 96 sq. ft. The dominant trees, *Quercus nigra* and *Q. virginiana*, averaged 69 ft. in height and 15 in. in diameter. *Sabal louisiana* is the only common shrub and *Oplismenus setarius* the predominant herb. *From authors' summary.*

12.19.2 (77.5) : 43. MAISSUROW, D. K. **The role of fire in the perpetuation of virgin forests of northern Wisconsin.** *J. For.* 39, 1941 (201–7).

The virgin forest of this region is represented primarily by mixed hardwood types growing on fertile, loamy soils. The dominant hardwood species are Sugar Maple, Yellow Birch and Basswood while the main softwood species are White Pine, Hemlock, White Spruce and Balsam Fir. Some 95 per cent. of this forest has been burned over in the last five centuries and from a broad ecological viewpoint fire has been a normal, beneficial and necessary factor in perpetuating the virgin forest as it is, and particularly species such as Yellow Birch, Hemlock, Pines and intolerant hardwoods. Reproduction studies show that Sugar Maple is the most abundant and that while light surface fires favour this species, hotter fires result in a greater percentage of Yellow Birch, Basswood, Elm, White Pine and Hemlock. All abnormally abundant reproduction except that of Sugar Maple was traced to surface fires.

In the mixed forest that has thus developed, two groups of trees of different origin and silvicultural characteristics are in association—the uneven-aged groups of tolerant hardwood that have developed during the period of uninterrupted growth, and even-aged groups of fire origin, composed of species that do not reproduce readily on the forest floor. Both reproduction and crown-composition studies clearly showed a gradual conversion of this mixed hardwood type into a pure Maple or Maple-Basswood climax. Development of this forest without interruption by fire or other agencies would result in continuous uneven-aged stands of poor quality Sugar Maple, interspersed with Basswood, over large areas of country.

12.19.2 (78.7) : 12.19.4 : 31.1 : 11.21 : 56.02 : 12.25. HANSEN, H. P. **Ring growth and dominance in a Spruce-Fir association in southern Wyoming.** *Amer. Midl. Nat.* 23, 1940 (442–7). [Oregon State College, Corvallis.] L.S.

In the Spruce/Fir climax formation on the east slope of the Medicine Bow Range in southeastern Wyoming, Spruce [*Picea engelmanni*] is dominant at present. On the basis of the size classes present and reproduction, Fir [*Abies lasiocarpa*] may eventually become at least as abundant as Spruce. Lodgepole Pine [*Pinus contorta*] will finally disappear if forest succession continues without interruption. Spruce is hardier than Fir. Spruce and Fir correlate fairly well with respect to the major trends of ring growth fluctuation. Spruce shows greater increment in its younger stages, while Fir shows greater growth as it becomes older, and the forest is more dense. Ring growth in Fir shows more extreme annual fluctuation, and Spruce records more constant trends of increase and decrease, suggesting that

Spruce is more stable and less influenced by annual variations in climate. *Author's summary.*

12.19.2 : 12.19.3 : 61. HASEL, A. A. **Estimation of vegetation-type areas by linear measurement.** *J. For.* 39, 1940 (34–40). [California Forest & Range Exp. Sta.]

The estimation of vegetation-type areas by linear measurement of parallel survey lines through each type and the conversion of these measurements to an area basis by using a factor, which varies with the spacing of the lines, has certain advantages over mapping as a method for determining type areas. It limits the error due to personal causes, makes possible the recording of as much detail as desired, and is relatively easy to apply and less costly than mapping. Its use is discussed in connexion with detailed studies of plots.

12.19.2 : 12.23. PATTERSON, P. M. **Corticolous bryophyte societies at Mountain Lake, Virginia.** *Amer. Midl. Nat.* 23, 1940 (421–41). L.S.

Nine well developed corticolous bryophyte societies are recognized at Mountain Lake, Virginia. Their individual occurrence and distribution are found by analyses of their environments to depend upon different levels of evaporational stress and different moisture holding capacities of the bark substrata. *Author's summary.*

12.19.2 : 12.25 : 22.89 : 11. BARTSCH, J. and M. Über den natürlichen Gesellschaftsanschluss der Fichte im Schwarzwald und ihren Einfluss auf den Standort bei künstlichem Anbau. [**On the status of Spruce in the natural associations of the Schwarzwald and its influence as a planted tree upon the site.**] *Allg. Forst- u. Jagdztg.* 117, 1941 (29–48, 63–80). [G.]

Spruce forms part of a number of natural associations in the Black Forest and, given proper silvicultural care, it can also be grown successfully on many sites outside its natural habitat. In places the productivity of the soil has been lowered by growing this species without adequate attention to the maintenance of soil fertility, and it is thought that the improvement of such sites by silvicultural means, e.g. admixture of Beech to Spruce plantations, may involve a temporary cessation of income from the forest.

12.19.2 : 12.25 : 12.19.4 (74.8). CHISMAN, H. H. **Shortleaf Pine in the Cumberland Valley.** *For. Leaves* 31 (2), 1941 (9–10).

Shortleaf Pine (*Pinus echinata*) is typically a southern tree and becomes established in pure stands in southern Pennsylvania only in old fields on the lower mountain slopes. Such stands are usually a transitional stage between cultivation and the climax forest association of Oak and Hickory.

12.19.3 *Other Vegetation Types*

12.19.3 : 23.3. (41.1–4). FRASER, G. K. **Vegetation survey of waste land in relation to the establishment of woodlands (with special reference to the north-east of Scotland).** *Forestry* 14, 1940 (59–70). [Macaulay Institute for Soil Research, Aberdeen.]

It is suggested that in general the original distribution of vegetation in this region consisted of the Oak—Pine—Birch—Heath sequence of plant communities, the woodland occupying the lower ground and heather the higher ground. Cultivation and grazing have caused most of area to be denuded of trees and now ground that is not planted or cultivated bears one of the following chief types of waste ground vegetation, with minor variations due to moisture differences, periodic flushing or other local conditions—marshland, wet meadow, fresh grassland, heath-grassland, *Calluna* heath, and alpine and sub-alpine types. *Calluna* heath covers most of the ground available for forest planting in north-east Scotland and is considered in detail. Three main groups of this type are recognized—dry heath, moist heath and wet heath—and each of these in turn is separated into local types on the basis of variation in vegetation. The natural conditions of these types are discussed and the method of their survey is described briefly.

12.19.3 : 61. PECHANEC, J. F. **Sampling error in range surveys of Sagebrush-grass vegetation.** *J. For.* 39, 1941 (52–4). [Intermountain Forest & Range Exp. Sta.]

12.19.4. *Succession*

12.19.4 : 12.19.2 : 12.26–8 : 11.4 (944). PIDGEON, I. M. **The ecology of the central coastal area of New South Wales. III. Types of primary succession.** *Proc. Linn. Soc. N.S.W.* 65, 1940 (221–49). [Botany School, University of Sydney.] L.S.

Five types of primary succession occurring in the central coastlands of New South Wales are summarized. These are the seres which begin on salt mud flats, in brackish water of lagoons, in fresh water, on windblown sand, and on sandstone rock. The convergence of these seres to the same climax, viz. Mixed *Eucalyptus* forest, is discussed. The environmental factors influencing the successions are briefly referred to. In particular, various aspects have been studied of the soil changes which accompany succession. Difficulties in the application of the concept of succession to the classification of the vegetation of the central coastlands are discussed. *Author's summary.*

12.2. *Special [Systematic] Botany*

12.21. Fungi

12.21 : 12.14.7. RUMBOLD, C. T. **Ascospores of *Ceratostomella ips* and *C. montium* [morphology and development].** *Abstract* in *Phytopathology* 31, 1941 (19).

12.21. ACREE, R. J. **Temperature as a precision factor in chemically distinguishing *Cronartium ribicola* and *C. occidentale*.** *Abstract* in *Phytopathology* 31, 1941 (1).

Temperatures below 70° and above 90° F. were found to be unsatisfactory for differentiating these two species by the microchemical colorimetric pH method.

12.21 : 12.1 : 31.42.11. HILBORN, M. T. **The biology of *Fomes fomentarius*.** *Abstract* in *Phytopathology* 31, 1941 (11).

The 1938 spore discharge covered about 180 days and showed 3 phases, the pre-peak, peak, and post-peak. During the pre-peak phase, but not later, the process was affected by humidity, and in the peak phase it was influenced by temperature. Various isolates in culture had considerably varying growth rates, due apparently to individual variation independent of either host or locality. The fungus simultaneously causes a typical heart rot and attacks the sapwood. Chemical studies showed that both lignin and cellulose are attacked and that all pentosans are utilized alike. A decrease in alkali solubility, characteristic of the white rots, was found. The calorific value of the decayed wood decreased proportionally to the losses in dry weight.

12.21 : 31.42.11 : 01.4. DAVIDSON, R. W., CAMPBELL, W. A., and ROTH, E. R. **Recent developments in methods of distinguishing wood rots.** *Abstract* in *Phytopathology* 31, 1941 (6).

Printed index cards have been devised for recording growth characteristics of fungi in culture. The cards can be filed according to key patterns based on such characteristics and compared with others on which the characteristics of cultures of known identity have been recorded.

12.25. Gymnosperms

12.25 : 21 : 31.0 : 23.3. POPENOE, W. ***Cupressus benthami* : a neglected opportunity?** *Trop. Woods* No. 65, 1941 (1–4).

Cupressus lusitanica (*benthami*) is a native of Mexico and Guatemala and has been reported as widely planted for ornament in the Central American States. In Guatemala it grows abundantly as a wild tree at altitudes of 8,000–11,000 ft. in the central and north-western regions, attaining heights of 70–80 ft. and diameters of 5–6 ft. The wood is soft and easily worked, resembling White Pine in colour and general appearance, and is locally well known as one of the chief commercial timbers of the country. It is used for general constructional work and also for furniture, though it has no particular beauty for the latter purpose. The tree has been extensively planted in Guatemala both as an ornamental and as a timber tree. It grows on many different soils and is able to thrive on volcanic pumice, where few other species succeed. It is easy to raise from seed and is drought- and frost-resistant. In view of these facts it is urged that the species should be worth trying for the afforestation of eroded and barren mountain sides in tropical America.

12.25. BRADSHAW, K. E. **Field characters distinguishing *Pinus ponderosa* and *P. jeffreyi*.** *Madroño* 6, 1941 (15–8). K.

Comparative external features such as foliage, limbs, bark, etc. are listed for both young and old trees and points of distinction between the two species are noted. The use of such comparisons and the relative value of each feature for identification purposes is discussed.

12.26–8. Dicotyledons

12.26–8 (59.1). FISCHER, C. E. C. **Contributions to the flora of Burma: XVIII.** *Kew Bull.* 1940 (288–94).

Includes descriptions of *Photinia rufa* and *Viburnum tricostatum* spp. nov.

12.26–8 (728). STANDLEY, P. C., and STEYERMARK, J. A. **Studies of Central American plants—I.** *Botanical Series, Field Museum of Natural History, Chicago* 22 (4), 1940 (221–321). L.S.

The following new tree species are described from Guatemala:—*Ficus cabusana, Dalbergia pacifica, Machaerium fruticetorum* (also from Salvador), *Ilex anodonta, Mouriria steyermarkii, Clethra johnstonii, C. pachecoana, C. skutchii, Styrax vulcanicola, Rondeletia izabalensis,* and *Verbesina steyermarkii.* A new genus, *Orthion,* is established in the Violaceae to receive *O. subsessile,* from Guatemala and British Honduras, and *O. malpighiifolium,* from British Honduras, both previously described by Standley under the same specific names in *Hybanthus.* A further new genus, *Bartholomaea,* is set up in the Flacourtiaceae, with one new species, *B. mollis,* from Guatemala, and *B. sessiliflora,* from British Honduras, the latter being a transfer from *Lunania.*

12.26–8 (728). STANDLEY, P. C., and STEYERMARK, J. A. **Studies of Central American plants—II.** *Botanical Series, Field Museum of Natural History, Chicago.* 22 (5), 1940 (325–96). L.S.

The new tree species and varieties published in this paper are:—*Aristolochia steyermarkii* from Guatemala, *Magnolia allenii* from Panama, *Phyllonoma cacuminis* from Guatemala, *Licania costaricensis* from Costa Rica, *Crudia lacus* from Guatemala, *Pithecolobium zollerianum* from Guatemala, *Phyllanthus skutchii* from Costa Rica, *Erblichia xylocarpa* var. *mollis* from Mexico and Guatemala, *E. standleyi* from Mexico and Honduras, *Eugenia chiquimulana, E. simiarum* and *E. steyermarkii* from Guatemala, *Mouriria gleasoniana* from Mexico and Guatemala, *Bumelia lesueurii* from Mexico, *Chrysophyllum panamense* var. *macrophyllum* from Panama, *Lucuma austin-smithii* from Costa Rica, *Sideroxylon steyermarkii* from Guatemala, *Gonzalagunia exaltata* from Costa Rica, and *Rudgea simiarum* from Guatemala.

12.26–8 (96.1–8) : 12.19.1. KANEHIRA, R., and SUMIHIKO, H. **New or noteworthy trees from Micronesia. XXII.** *Bot. Mag., Tokyo* 53, 1939 (151–7, 189–203). Biol. Abs. 15 (1031).

12.26–8 (728). BARKLEY, F. A., and REED, M. J. ***Pseudosmodingium* and *Mosquitoxylum.*** *Amer. Midl. Nat.* 24, 1940 (666–79). [Montana State University, Missoula.] L.S.

The generic features of *Pseudosmodingium* and *Mosquitoxylum* are contrasted and keys are provided (i) to the American genera of the *Rhus* group, and (ii) to the species of *Pseudosmodingium* and *Mosquitoxylum.* The latter are described and records of distribution given. A Latin diagnosis is included of one new variety, *Mosquitoxylum jamaicense* var. *panamense,* which occurs from Mexico southward to Panama.

12.26–8. BARKLEY, F. A. **Studies in the Anacardiaceae—V.** *Amer. Midl. Nat.* 24, 1940 (680). [Montana State University, Missoula.] L.S.

Rhus delavayi Franchet and *R. verniciflua* Stokes are transferred under the same specific epithets to *Toxicodendron.*

12.26–8. BARKLEY, F. A. ***Schmaltzia.*** *Amer. Midl. Nat.* 24, 1940 (647–65). [Montana State University, Missoula.] L.S.

The author now considers *Schmaltzia* to be a separate genus, instead of a subgenus of *Rhus,* and the present paper is essentially a list of new combinations for species transferred from *Rhus,* together with some additional locality records.

12.26–8. ALLEN, C. K. **Studies in the Lauraceae, III. Some critical and new species of Asiatic *Lindera,* with occasional notes on *Litsea.*** *J. Arnold Arbor.* 22, 1941 (1–31). [Arnold Arboretum, Harvard University.]

Ten new species of *Lindera* and two of *Litsea* are described and critical species and varieties of the former genus are discussed.

12.26–8 (95 : 96). SMITH, A. C. **Studies of Papuasian plants, I.** *J. Arnold Arbor.* 22, 1941 (60–80). [Arnold Arboretum, Harvard University.]

Twelve new species of *Myristica* and four of *Horsfieldia* are described.

12.26–8 (5). WALKER, E. H. **A revision of the eastern Asiatic Myrsinaceae.** *Philipp. J. Sci.* 73, 1940 (1–258). [Smithsonian Institution, Washington, D.C.] L.S.

A comprehensive study, with keys to genera and species.

12.26–8 (8). AMSHOFF, G. J. H. **On South American Papilionaceae.** *Meded. bot. Mus. Herb. Rijksuniv. Utrecht* 52, 1939 (1–78). Biol. Abs. 15 (2755).

12.26–8 (95). MERRILL, E. D., and PERRY, L. M. **Plantae Papuanae Archboldianae, V.** *J. Arnold Arbor.* 22, 1941 (32–59). [Arnold Arboretum, Harvard University.]

The Rutaceae alone are dealt with in this paper, which includes descriptions of one new species in *Zanthoxylum*, twelve in *Evodia*, eleven in *Melicope*, three in *Acronychia*, and one in *Flindersia*.

12.26–8 (943). WHITE, C. T. **A new genus of Flacourtiaceae (Pangieae—Hydnocarpinae) from tropical Queensland.** *J. Arnold Arbor.* 22, 1941 (143–4). [Botanic Gardens, Brisbane.]

Baileyoxylon lanceolatum gen. et sp. nov. is described and figured from the Atherton Tableland in tropical Queensland, where it occurs as a rain-forest tree up to 25 m. (about 80 ft.) high.

12.26–8 : 12.14 : 12.19 : 21 : 31.1 : 47. ROTHMALER, W., and VASCONCELLOS, J. DE C. *Betula celtiberica* Rothm. et Vasc. Ein Beitrag zur Systematik der westeuropäischen Birken. [***Betula celtiberica* Rothm. and Vasc. A contribution to the taxonomy of the western European Birches.**] *Bol. Soc. broteriana*, Ser. II, 14, 1940 (139–75). [G.port.] P.R.

Description of *B. celtiberica* Rothm. et Vasc. sp. nov., including micro-anatomy of the timber, and comparison of the characters of this species with those of *B. pendula* and *B. pubescens*. Notes are included on the diseases, silviculture, utilization, and geographic distribution of *B. celtiberica*.

12.26–8 (95). SUMMERHAYES, V. S. **Additions to our knowledge of the Figs of New Guinea.** *J. Arnold Arbor.* 22, 1941 (81–109). [Royal Botanic Gardens, Kew.]

Includes critical notes on the taxonomy and distribution of many species of *Ficus* in Papua and descriptions of nine new species.

12.26–8 (59.5 : 91). BREMEKAMP, C. E. B. **The Malaysian species of the genus *Ixora* (Rub.), additions and emendations.** *Bull. Jard. bot.* (*Buitenzorg*) 16 (3), 1940 (276–99). Biol. Abs. 15 (2759).

12.26–8 (8). DUCKE, A. **Revision of the *Macrolobium* species of the Amazonian hylaea.** *Trop. Woods* No. 65, 1941 (21–31). [Jardim Botanico do Rio de Janeiro.]

A key is given to the 29 species recognized and their distribution is recorded.

12.26–8 (75.8). DUNCAN, W. H. **A new species of Oak from Georgia.** *Amer. Midl. Nat.* 24, 1940 (755–6). [University of Georgia, Athens.] L.S.

Quercus oglethorpensis sp. nov., an entire-leaved species of the White Oak group, is described from Oglethorpe, Wilkes, and Elbert Counties, Georgia, where it is abundant in the better drained bottomlands.

12.26–8 (76.4) : 12.19.1. MULLER, C. H. **Oaks of trans-Pecos Texas.** *Amer. Midl. Nat.* 24, 1940 (703–28). [Bureau of Plant Industry, U.S.D.A.] L.S.

The 18 species of *Quercus* known to occur in Texas west of the Pecos River are keyed out, described, and illustrated.

12.26–8. FLODERUS, B. **Some new *Salix* species and hybrids.** *Bot. Notiser* 1940 (227–30). Pl. Sci. Lit. 13 (5), (6).

S. bhutanensis sp. nov.

12.26–8. MONACHINO, J. **A note on *Sapium*.** *Bull. Torrey bot. Cl.* 67, 1940 (771–2). [New York Botanical Garden.] O.B.D.

Sapium biglandulosum (Aubl.) Müll. Arg. var. *nitidum* Monachino, var. nov., is described from British Honduras. It is said to be a common tree, up to 60 ft. tall, on both alluvium and limestone soils. *S. oligoneurum* K. Schum. and Pittier, *S. sulciferum* Pittier, and *S. bogotense* Huber are reduced to varietal rank under *S. biglandulosum*.

12.26–8. MONACHINO, J. **A new genus and species of Sterculiaceae.** *Bull. Torrey bot. Cl.* 67, 1940 (621–2). [New York Botanical Garden.] O.B.D.

English and Latin diagnoses are given for *Veeresia* Monachino et Moldenke gen. nov., with *V. clarkii* as the generic and specific type. *Veeresia* appears to be closely related to *Reevesia*, a genus of Asiatic distribution. *V. clarkii* is a large tree found on mountain sides north of Chapahuacan, Hidalgo, Mexico, at an altitude of 8,000 ft.

13.1. *General Zoology*

13.15 : 13.2 : 12.25. KIRIKOV, S. V. **On the relationship between Red Crossbills (*Loxia***

***curvirostra* L.) and certain species of conifers.** *Izvestiya Akademii Nauk S.S.S.R.*, Ser. Biol., 1940 (3), (359–76). [R.e.] A.P.B.

According to the author's observations, Pine seed is the chief food of the Red Crossbills inhabiting the Pine forests of southern Ural. Hitherto it was generally thought that *L. curvirostra* fed principally on the seed of Spruce, Silver Fir, and Larch, and very seldom on that of Pine.

13.15 : 13.2. GARDNER, J. C. M. **The puparia of some Indian Tachinidae (Diptera).** *Indian For. Rec. (n.s.) Entomology* 6, 1940 (227–51). [Forest Research Institute, Dehra Dun, U.P.]

13.15 : 13.2 : 11.4 : 12.19.2. STRANDINE, E. J. **A quantitative study of the periodical cicada with respect to soil of three forests.** *Amer. Midl. Nat.* 24, 1940 (177–83). L.S.

Comparison of population of cicadas in three forests showed the greatest number (202,876 per acre) in a Red Oak/White Oak/Maple forest and the smallest (51,397 per acre) in a Sugar Maple forest. Size of population was found to be correlated with soil moisture, excessive moisture apparently limiting distribution of *Magicicada septendecim.* To a lesser extent soil acidity may limit the distribution of the cicada population in a given forest. *From author's summary.*

13.15 : 13.2 : 12.21. PARKIN, E. A. **Symbiosis in larval Siricidae (Hymenoptera).** *Nature, Lond.* 147, 1941 (329). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The presence of a symbiotic basidiomycete in adult females of *Sirex gigas* L. has been noted by several authors, and it has been shown that the fungi in this and other species are common wood destroyers that can exist independently. As each insect egg passes through the ovipositor it is coated with oidia of the fungus, which grows into the wood in advance of the larva and may be the insect's source of food. Hitherto no such fungus has been found in the larva itself, but during the author's work on *S. gigas* and *S. cyaneus* F. it was discovered in special organs arising from a modification of the larval integument, which were found in a proportion of the larvae corresponding approximately to the sex ratio of adults and pupae taken from the same log section, suggesting that they are present in female larvae only. The fungus was determined in culture as *Stereum sanguinolentum* (A. and S.) Fr. The significance of the organs in the larvae is not yet clear, particularly as they are absent from the pupal stage.

2. SILVICULTURE

2 : 12.25 (43.1–5). SPEER, W. Über den Anbau der europäischen Lärche in Württemberg im vorigen Jahrhundert. **[On the cultivation of European Larch in Württemberg in the last century.]** *Allg. Forst- u. Jagdztg.* 117, 1941 (57–63). [G.]

The documentary evidence presented indicates that the seed of the European Larch planted in Württemberg in the forties of the last century was imported from the Tyrol.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.0. *Adaptability to the General Environment. Acclimatization*

21.0 (729.2). SWABEY, C. **Exotic trees at a tropical hill station.** *Carib. For.* 2, 1940–41 (73–4). [E.span.]

In 1868 the Government of Jamaica established a station for the experimental cultivation of *Cinchona* at an elevation of about 5,000 ft. in the Blue Mountains. Later on this work was abandoned owing to a drop in quinine prices, and the gardens were then planted with a great variety of economic and ornamental trees. A list is given of those species that have done well on this site.

21.0 : 12.25 : 12.26–8 : 12.14.3 : 11.49.5 : 11.41. KRAUSS, G., MULLER, K., and GÄRTNER, G. Standortsgemässe Durchführung der Abkehr von der Fichtenwirtschaft im nordwestsächsischen Niederland (mit grundsätzlichen Bemerkungen über 'gleiartige' Bodenbildung). **[Effecting the change-over from Spruce management in the lowlands of north-west Saxony in conformance with site factors (with fundamental observations**

on the formation of gley soils).] *Thar. forstl. Jb.* 90, 1939 (481–715). [G.] R.M.I.

A study was made of the conditions, chiefly of soil, that are responsible for the poor growth of Norway Spruce in this region, and of the best means of effecting conversion to hardwood forest. Accounts are included of the climate, situation and local geology; the nature of the soil, especially the water-holding and air capacity of the gley soils; the relation of vegetation types to the soil; correlations between growing stock and habitat; and the carrying out of the necessary silvicultural measures. The region offers a striking example of a crop ill adapted to the site. The poor water-holding capacity of the soil is aggravated by the growing of Spruce and the dry climate. The original cover of Oak, Hornbeam, Lime, Alder, Birch and shrubs should be re-established, with the possible addition of Larch and Scots Pine. Numerous investigations of root systems showed that the soil under Spruce was insufficiently decomposed, owing to the shallow rooting habit of this species, whereas hardwoods showed healthy root penetration even in the gley soils.

21.1. *Light and Temperature Requirements*

21.11 : 12.26–8 : 12.25 : 12.11.3. SYLVÉN, N. Lång- och kortdagstyper av de svenska skogsträden. **[Long- and short-day types of Swedish forest trees.]** *Svensk PappTidn.* 43, 1940 (317–24, 332–42). [Sw.] L.S.

In early 1938 the Swedish Forest Tree Breeding Association carried out a large number of crosses between different types of Aspen (*Populus tremula*) from various parts of the country. The progenies of these were grown at Ekebo, in Skåne, and were seen later in the year to show marked variations in growth, of a kind that strongly suggested the presence of different photoperiodic strains among the parents—crosses of south-Swedish parentage growing normally while those of north-Swedish parentage developed for the most part as dwarfed rosette plants and those of central-Swedish parentage were intermediate. The summer daylight at the northernmost of the places represented is as much as 24 hrs., whereas that at Ekebo is only 20 hrs. at the most. In view of these facts a special investigation was begun in 1939. Eighteen of the crosses were put out in cold frames at Vittjärv (lat. 65° 50′ N.), Söråker (lat. 62° 30′ N.), and Ekebo (lat. 56° N.). At each of these stations half of the plants of each separate cross were given full daylight while the other half were kept dark between 7 p.m. and 7 a.m. throughout the summer and up to mid-September. The results of this experiment, which are fully tabulated and discussed in much detail, confirmed the existence of the suspected photoperiodic strains. Among the progenies used, 8 were 'local crosses', i.e. crosses between parents growing at roughly the same latitude. Local crosses between parents from latitude 61° 50′ or farther north grew normally under full length of day at Vittjärv, showing no rosette plants and averaging about 27 to 36 cm. in length in the several progenies, whereas with 12-hr. days at the same station the number of rosette plants varied between 33 and 100 per cent. and the average plant lengths between about 2·8 and 7·3 cm. Results at Söråker did not differ greatly from those at Vittjärv, but at Ekebo the full-day treatment gave 69–100 per cent. of rosette plants and average plant lengths of 1·7 to 4·9 cm., while the 12-hr. day gave 91–100 per cent. of rosette plants and plant lengths averaging from 0·8 to 3·1 cm. There was thus ample evidence that the progenies of northern parentage had a marked long-day character, and from other results it was also clear that those with southern parents were comparatively short-day plants. Crosses of northern parentage gave the most uniform results and are therefore regarded as largely homozygous for the long-day character. Those of extreme southern parentage were likewise chiefly homozygous short-day types, but the central Swedish stocks appeared to be far more heterozygous. The results obtained with crosses of mixed geographical parentage are reviewed with special consideration of the homo- or heterozygous nature of the parent stocks. From the foregoing it seems that the northern long-day Aspen is so severely retarded in growth by south-Swedish photoperiods that its future range of cultivation must be determined in accordance with its range of photoperiodic tolerance, and further investigations are to be made to obtain more precise information on the practical, economic range for various strains. The short-day type, on the other hand, shows better growth under the long days of northern latitudes than in its own natural range—in fact, the growth of all strains improved in general with increasing

latitude—but frost hardiness replaces the photoperiod as a limiting factor. The long- and short-day types showed distinct differences in their growth periods during the experiment. The northern long-day type had finished its height growth by the end of August or the beginning of September, its shoots were fully lignified and the winter buds had formed. The south-Swedish short-day type, however, still had growing, unlignified shoot tips and no mature buds, consequently as early as mid-September this type showed fairly serious frost damage at Söråker.

The proof of photoperiodism in Aspen raises the question of its possible occurrence in other Swedish trees. Two subspecies of Scots Pine —the northern *Pinus sylvestris lapponica* and the southern *P. sylvestris septentrionalis*—are already recognized in Sweden, and there have been many references in literature to the poor growth of the former in southern Sweden. No special investigation of photoperiodism has been made for this species, but it is stated that the growth characteristics of northern and southern races grown together in a nursery in Skåne exhibit differences that are strikingly parallel to those found in Aspen. In the light of this and other Swedish experience of Pine races, and of reports by prominent workers on seed-origin investigations in Germany, Austria, and Switzerland, it is believed that there can be little doubt of the existence of photoperiodic strains in this species. [*Final instalment of this paper not available for abstracting.*]

21.11 : 21.8 : 11.15. PHILLIPS, J. E. **Effect of day length on dormancy in tree seedlings.** *J. For.* 39, 1941 (55–9). [State Division of Forestry, Baxley, Ga.]

The addition of red (680–1,400 mu) irradiation at night to increase short winter days to 18 hours caused Loblolly Pine, Northern White Cedar (*Thuja occidentalis*) and Black Locust to grow more quickly, the Pine and Locust to produce greater fresh and dry weights, and the Locust to have a greater top/root ratio than when grown under other experimental conditions. The addition of blue (380–510 mu) irradiation produced stunting effects in Loblolly Pine and Black Locust, both as to height and fresh and dry weights, and caused the growth of Northern White Cedar to be reduced both in rate and amount. Both Pine and Cedar came out of the dormant state at about the same time under the blue and control light conditions.

Under natural short days Loblolly Pine and Northern White Cedar remained at a standstill, and Black Locust grew at a relatively slow rate until the amount of sunlight increased in early spring. Red Gum (*Liquidambar styraciflua*) plants used in this experiment had already formed an abscission layer before being brought into the greenhouse and leaf fall occurred shortly afterwards. Activity was resumed at approximately the same time in early spring under the three light conditions. All plants were grown under greenhouse conditions and received natural daylight. *From author's summary.*

21.12 : 42.21 : 12.14.1. SIMINOVITCH, D., and LEVITT, J. **The relation between frost resistance and the physical state of protoplasm. II. The protoplasmic surface.** *Canad. J. Res.* 19, Sec. C, 1941 (9–20). [McGill University, Montreal.] P.R.

21.6. *Growth Form. Habit. Behaviour in the Stand*

21.6 : 12.26–8 : 12.11.3. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Of ten hybrid poplars introduced from the United States in 1938, the varieties Oxford, Geneva and Strathglass, in this order, are the most promising as regards vigour and freedom from branches (p. 23).

21.61 : 12.26–8 : 12.11.3. HOPP, H. **Growth and form variation in Black Locust and its importance in farm planting.** *J. For.* 39, 1941 (40–6). [Soil Conservation Service, Beltsville, Md.]

Most Black Locust (*Robinia pseudoacacia*) trees can be classified into three major groups, based on the dominant character of the tree appearance, regardless of site influences. The growth-forms represented by these groups are designated as :—(1) Pinnate, in which the habit of growth tends to produce a well-defined stem with forks and crooks either absent or of a fixed character (determinative), and with a low form-point. (2) Spreading, in which the habit of growth is determinative with a high form-point. (3) Palmate, in which the habit of growth tends to produce many small branches but no easily-traced stem (diffusive). These three growth-forms appear to be true genetic types, and as such should be a valuable guide in the selection of seed of this species for farm

planting. It is pointed out that the pinnate form seems better adapted for the open type of planting whereas the palmate form is better suited to the extremely close-spaced types of planting.

21.64 : 22.89 : 11.48 : 11.33 : 11.2. MINCKLER, L. S. **Plantation survival as related to soil type, aspect, and growing season.** *J. For.* 39, 1941 (26–9). [Appalachian Forest Exp. Sta.]

Analysis of first-year survival data of a planting experiment involving five species, three soil types, and two slope aspects showed that: (i) Shortleaf Pine did best on dolomite north or south and limestone south aspects, the limestone and shale north slopes being characterized by dense vegetation and the shale south slope tending to drought conditions. (ii) White Pine and Yellow Poplar did best on dolomite north or south and limestone north aspects. In a very dry year both species gave only fair survival on limestone south slopes and failed on shale south slopes. White Pine was less tolerant of heavy vegetative competition than was Yellow Poplar. (iii) White Ash did equally well on all soil types and aspects, and Black Walnut showed relatively poor survival only on dolomite south slopes. (iv) The two direct-seeded species, Black Walnut and Northern Red Oak, showed much better than average ability to withstand drought. This is attributed to a more natural and extensive root system. (v) Mortality caused by drought was greatest on shale and limestone south slopes and for Yellow Poplar, White Pine, and Shortleaf Pine. (vi) When all soil type/aspect classes were considered together, Ash and Walnut constituted the highest survival group, Yellow Poplar the second, and White and Shortleaf Pine the third. *From author's summary.*

21.64 : 57.4 : 22.14.2 : 12.25. CHAIKEN, L. E. **Growth and mortality during 10 years following partial cuttings in Loblolly Pine.** *J. For.* 39, 1941 (324–9). [Appalachian Forest Exp. Sta.]

Two examples of partially cut stands of Loblolly Pine are analysed—the first (South Carolina) under-stocked, and somewhat uneven-aged, is typical of large areas in the coastal region, the second (North Carolina) is representative of much smaller areas of densely stocked, even-aged stands growing on highly productive old-field sites. It was found that while selective cutting resulted in a sharp increase in the diameter increment of released surviving trees, there was also a very high mortality among the smaller reserved trees. The specific causes for this were not fully studied. In future trees that may be expected to die following cutting could be included in the operation—particularly trees severely damaged by logging and those suppressed or intermediate with short and narrow crowns. It is pointed out that the great variety of stand conditions and methods of management for this type make it difficult to apply the results of any one study to the region as a whole.

21.8. *Phenology*

21.8 : 12.25 : 12.26–8 : 56.01. JOHNSTON, J. P. **Height-growth periods of Oak and Pine reproduction in the Missouri Ozarks.** *J. For.* 39, 1941 (67–8). [Central States For. Exp. Sta.]

Measurements indicate that the current height growth of Oak reproduction is restricted to a short period at the beginning of the growing season and therefore is not affected by summer rains, whereas the height growth of Pine reproduction continues throughout the growing season.

21.9. *Longevity*

21.9 (73). **American big trees.** *Amer. Forests* 47, 1941 (180–1).

List of the largest trees of certain species that have so far been reported. Species name, circumference, spread, height and location are given for each specimen.

21.9 : 12.26–8. SMITH, L. F. **A growth-ring study of an unusually old Bur Oak in Miami County, Kansas.** *Trans. Kans. Acad. Sci.* 43, 1940 (173–5). N.H.M.

The cross section, on which 303 growth rings were counted, was sound except for a small hole at the centre.

22. SILVICULTURAL SYSTEMS.

FORMS OF STAND

22.14.1. ZIMMERLE, H. Nochmals zur Plenterwaldfrage. **[Further notes on the problem of selection forest.]** *Allg. Forst- u. Jagdztg.* 117, 1941 (85–124). [G.]

Mainly a comparison, based on sample-plot data from Silver Fir and other stands in Württemberg, of the structure of selection and even-aged forests and of those occupying an

intermediate position between the two. Number-of-stems/diameter-class distribution is considered a simple and practical means of defining the structure of a selection forest and of comparing it with that of an even-aged forest. Stem-number data, grouped according to the six Swiss diameter classes (d.b.h. 8–14, 16–24, 26–36, 38–50, 52–70, and over 70 cm.), showed a decrease in number of stems per diameter class from the lowest towards the highest class in the case of selection stands, while in the even-aged stands a fairly 'normal' distribution was observed. In the latter stands, the highest values for number of stems and total basal area were usually found in the same diameter class. The numerical distribution, according to 5 cm. diameter classes, of stems in the selection plots approximated the geometrical series which Liocourt used as a criterion of 'normal' stem distribution in Silver Fir selection forests (A, Aq^{-1}, Aq^{-2}..., $Aq^{-(n-1)}$ where n is the number of d.b.h. classes, q is the quotient of the stem numbers of two consecutive classes, and A is the stem number of the lowest class; and where $A = q^n$, and hence $Aq^{-(n-1)} = q$).

Other matters dealt with include a few growth data from selection woods in Württemberg and a summary of the available statistics on the distribution of selection forests in Southern Germany, Austria and Switzerland according to species and type of ownership. Those for Switzerland are taken from Frankhauser (*Forstw. Zentralbl.* 1908), which appear to be the only data available.

22.14.2 : 12.25 : 66. MUNGER, T. T. **They discuss the maturity selection system.** *J. For.* 39, 1941 (297–303). [Pacific Northwest Forest Exp. Sta.]

Cheap truck logging and the use of tractors for skidding has greatly reduced the difference in cost between heavy and light cuts per acre. By the maturity selection system, which is particularly applicable to the Ponderosa Pine type, it is proposed to remove trees biologically and economically most mature as judged by mortality probability, growth rate and carrying charges, resulting in a probable cut of from 20 to 60 per cent. of the volume, depending on the stand. Some advantages of this system are a rapid cut over the whole working circle and the utilization of many trees that would be lost in a longer cutting cycle, the retention of a substantial forest capital and protection of the area from exposure, the elimination of slash disposal except along roadways, and an increase in the average quality of the logs.

22.2 : 12.26–8 : 23.25 : 56. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria, 1940. pp. 37.

Four-year-old coppice of *Eucalyptus microcorys* shows consistently better diameter and height growth than seedlings of this species at the same age and espacement (p. 23).

23. FORMATION OF STANDS

23 : 12.26–8 : 11.34 : 21. JESSE, W. C. Een en ander over het cultuurbedrijf van Kelampajan (*Anthocephalus cadamba* Miq.) in het Djembajan stroomgebied (Oost Borneo). [**Remarks on the cultivation of Kelampayan (*Anthocephalus cadamba* Miq.) in the Djembajan basin (East Borneo).**] *Tectona* 34, 1941 (86–96). [Du.e.]

In East Borneo Kelampayan grows best on the elevated banks along the rivers and at the foot of the hills shelving into the swamps. In these localities reproduction is best by natural means. A plan for plantation work in the Djembajan basin is included.

23.1. *Natural Regeneration*

23.1. LYNCH, D. W., and SCHUMACHER, F. X. **Concerning the dispersion of natural regeneration.** *J. For.* 39, 1941 (49–51). [Duke Forest, Durham, N.C.]

Analysis of data on the stocking of cut-over lands in the Western White Pine type, obtained by means of milacre and 4-milacre quadrats, shows that consistent estimates of stocking for this type may be based on the use of quadrats of any unit size within this range.

23.1. ANDAMANS. **Report on forest administration for the year 1938-39.** Manager of Publications, Delhi. 1940. pp. 81.

A successful method of establishing natural regeneration in deciduous forests is to cut everything but the seed trees in December to February and make the final felling immediately after the first weeding in August to September (p. 2).

23.1 : 12.25. UNITED STATES. **Annual report of Intermountain Forest and Range Experiment Station for 1940.** Ogden, Utah. 1941. pp. 56 + ix.

In a study of the factors affecting the natural reproduction of Ponderosa Pine in central Idaho it was found that: (*a*) In good seed years stands provided abundantly for reproduction. (*b*) Little seed is carried more than 100 ft. from the parent trees. (*c*) Quality of seed varied widely with factors such as season, location, and individual tree, and with quantity production of seed, the percentage of viable seed being higher for trees with large numbers of cones. (*d*) While 76 per cent. of the trees were less than 10 in. d.b.h. these trees contributed only 3·1 per cent. of the cones produced in the year of measurement. (*e*) Seedling losses are due largely to competition from native vegetation and the effect of overhead shade (pp. 6–8).

23.13 : 12.26–8 : 11.14.3. WARREN, W. D. M. **Sal regeneration *de novo* in B_3 Sal.** *Indian For.* 67, 1941 (1116–23).

It is suggested that the relatively poor development of Sal regeneration in the Bhabar Tract is due to unfavourable pre-monsoon rainfall conditions in the United Provinces where climate retrogression has been in evidence since extensive fellings have taken place. Contour trenching in the dry forest types is recommended as a means of increasing soil moisture, thus improving forest growth, which in turn will have a beneficial humidifying and cooling effect on the surrounding atmosphere.

23.2. *Artificial Regeneration*

23.21. Choice of Species

23.21 : 23.3 : 21.3 : 11.49 : 12.19.3 (41.1–4). STEVEN, H. M. **Choice of tree species in the north-east of Scotland on the basis of soil and vegetation types.** *Forestry* 14, 1940 (81–5).

A brief discussion is given of the choice of tree species based on the soil and vegetation types defined in papers by Fraser [cf. *For. Abs.* 3 (34)] and Muir [cf. *For. Abs.* 3 (22)], and the points of silvicultural importance in different types are stated.

23.22. Preparatory Work. Auxiliary Measures

23.22.1 : 07.7 : 76.1 : 81 : 23.6. LUBISCH, H. Motorisierung und Organisation des Vollumbruch-Betriebes im Oberforstmeisterbezirk Frankfurt-Küstrin. **[Mechanization and organization of full ploughing in the Frankfurt-Küstrin forest district.]** *Forstarchiv* 17, 1941 (1–23). [G.g.]

By using own tractors for deep ploughing and other cultivation in areas completely overgrown with weeds (chiefly *Carex*), the cost of preparing the land amounted to only RM.58 per ha. exclusive of the amortization of the tractors, as against RM.385 when these operations were carried out with hired horse teams. At the same time preparation of the land was speeded up, an average rate of 100 ha. per tractor per annum being attained by working at times in two shifts. All stumps had to be removed before cultivating by tractor and their value usually covered the cost of extraction. The tractor work was not practicable on steep slopes. A further cheapening and acceleration of the reforestation (with Pine) was attained by resorting so far as possible to sowing, in some instances between rows of winter rye so as to protect the seedlings from wind, and by the use of motorized hoeing machines for cultivating sown and planted areas.

23.22.1 : 11.11.2. GEIGER, R., and FRITZSCHE, G. Spätfrost und Vollumbruch. **[Late frost and full ploughing.]** *Forstarchiv* 16, 1940 (141–56). [G.] R.M.I.

The temperature of the soil surface after it had been completely broken up was 4° higher during the critical nights of the late frosts in 1939 than that left without treatment.

23.22.1 : 38.62. GUT, R.-C. Chevrons d'assainissement et de reboisement. **[V-shaped trenched spots for soil improvement and reforestation.]** *J. for. suisse* 91, 1940 (185–9). [F.] Biol. Abs. 15 (6151).

On slopes of the Alps where drainage is too expensive, drained spots (not more than 100 per ha.) for reforestation may be prepared by making ditches in the shape of an inverted V with arms about 1 m. long and throwing the ditchings into the middle, where tree seeds or plants may be established.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.1 : 12.25. HEALY, V. M. **The collection and extraction of *P[inus] radiata* seed at Mt. Burr, South Australia.** *Aust. For.* 5, 1940 (103–5).

A large amount of this seed is annually distributed from Mt. Burr Forest both for local and inter-State use. The seed is graded according to dominance, anatomical characters, and age of the maternal tree.

23.23.15 : 12.25. UNITED STATES. **Annual report of Intermountain Forest and Range Experiment Station for 1940.** Ogden, Utah. 1941. pp. 56 + ix.

When stored in air-tight containers Ponderosa Pine seed maintains fairly good viability for at least 4 years under a considerable range of temperatures, the conditions giving the highest germination per cent. of those so far tested being storage in glass jars in an above-ground cellar (pp. 8–9).

23.23.15 : 12.26–8 : 12.11.21. DREES, E. M. Kiemproeven en kiemplanten. I. *Acacia*. **[Germination tests and seedlings. I. *Acacia*.]** *Tectona* 34, 1941 (1–45). [Du.e.]

Report on germination experiments with eleven *Acacia* species at the Forest Research Institute at Buitenzorg. The directions for practical use derived from these tests are summarized in the statement on the opposite page. The paper includes a description of the seedlings of the genus *Acacia* with a key for the identification of thirteen species, drawings of which are appended.

23.23.15 : 12.26–8. PRASAD, J. **Germination of Nim seed (*Azadirachta indica* A. Juss.).** *Indian For.* 67, 1941 (58–60). [Forest Research Institute, Dehra Dun.]

Repeat experiments confirm earlier findings that depulping and cleaning is the best method of pretreating seed of this species. [Cf. *For. Abs.* 1 (88).]

23.23.19 : 12.25. SCHMIDT, W. Warum kein Pflanzenprozent von 99? Besteht unser Saatgut nach der Selen- und Tellurfärbungsmethode Hasegawas grossenteils aus 'Mattkeimern'? **[Why no plant per cent. of 99? Does our seed consist largely of 'feeble germinators' according to Hasegawa's selenium and tellurium staining method?.]** *Dtsch. Forstw.* 21, 1939 (261–6, 273–7, 289–93, 321–4, 336–7). [G.] Forstl. Rundsch. 12 (18). H.S.B.

The selenium method and most tellurium methods of seed testing have nothing to do with viability, but indigo-carmine and sodium tellurate tests are useful.

23.23.3. *Methods of Sowing*

23.23.3 : 23.22.1. WAPPES, L. Über Freisaaten. **[On broadcast sowing.]** *Forstarchiv* 16, 1940 (61–7). [G.] R.M.I.

A description of broadcast sowing with little or no soil cultivation. The chief advantage of sowing over planting is economy in labour and money. Details are given of the broadcast sowing of Larch, Silver Fir, Weymouth Pine, and certain hardwood species.

23.24. Formation of Stands by Planting

23.24 : 12.25. UNITED STATES. **Annual report of Intermountain Forest and Range Experiment Station for 1940.** Ogden, Utah. 1941. pp. 56 + ix.

Results from planting experiments with Ponderosa Pine suggest that the following procedures are favourable to increased survival: (*a*) Use of graded stock with thick stems, small tops, and well developed root preferably 12 in. long. (*b*) Planting in holes dug with shovel or mattock. (*c*) Use of spot-scalping method where there is heavy brush or other vegetation. This is also advantageous in direct sowing. (*d*) In spring, planting the drier sites first, soon after snow recession. (*e*) Planting in the fall only if rains have moistened top 15–18 in. of soil. (*f*) Care in handling and planting (p. 9).

23.24.1. *Planting Material*

23.24.1 : 12.26–8. PETHERHAM, H. D., and PORTERFIELD, H. G. **Cold storage of deciduous planting stock.** *J. For.* 39, 1941 (336–8). [Soil Conservation Service.]

Cold storage of nursery stock from early March to late May was successfully used in maintaining dormancy of stock without the development of moulds and was followed by a satisfactory survival after planting. The temperature was kept within the range 28°–34° F. and a high humidity was maintained with moist straw and moss. The species tested were *Ulmus pumila*, *Gleditsia triacanthos*, *Robinia pseudoacacia*, *Populus sargentii*, *P. texana*, *Celtis occidentalis*, and *Maclura pomifera*.

23.24.1 : 12.26–8. GOLD COAST. **Report on the Forestry Department for the year 1939-40.** Govt. Printing Dept. (Publications Branch), Accra. 1940. pp. 8.

RECOMMENDED TREATMENT OF *Acacia* SEEDS

Species	*Method of storage after drying the seeds*	*Maximum period of storage*	*Necessary period of after-ripening*	*Special treatment*	*Manner of sowing*
Acacia arabica var. *telia* Willd.	In air-tight container	At least 12 months	Probably none	Pouring boiling water over the seed and soaking for 24 hours	In full light
Acacia auriculiformis A. Cunn.	Idem	At least 18 months	2 months	Idem	Idem
Acacia decurrens var. *mollis* Benth.	Idem	A long time	?	Idem	Idem
Acacia elata A. Cunn.	Idem	At least 9 months	None	Idem	In the shade
Acacia leucophloea Willd.	No special method required	At least 24 months	4 months	Heating with water to boiling point and soaking for 24 hours	In full light
Acacia longifolia Willd.	?	?	?	Pouring boiling water over the seed and soaking for 24 hours	In the shade
Acacia melanoxylon R. Br.	In air-tight container	At least 3 months	?	Idem	In full light after germination in germinator
Acacia oraria F. v. Muell.	Idem	At least 12 months	?	Pouring water at 60–70° C. over the seed and soaking for 24 hours	In the shade (not deeper than 1 cm.)
Acacia pruinosa A. Cunn.	?	?	?	Pouring boiling water over the seed and soaking for 24 hours	In the shade
Acacia tomentosa Willd.	No special method required for short periods; for more than 6 months in air-tight container	Where no special method employed: 6 months; in air-tight container: at least 24 months	Preferably 4 months in a shallow basket	Fresh seeds: heating with water to boiling point and soaking for 24 hours; old seeds: pouring boiling water over the seed and soaking for 24 hours	In full light
Acacia villosa Willd.	No special method required	At least 30 months	Idem	Pouring boiling water over the seed and soaking for 24 hours	Idem

Chlorophora excelsa has been successfully established by stump planting in the Northern Territories, several hundred miles outside its natural range, and at the end of the first year the average height growth was 5 ft., and gall attack was absent (p. 3).

23.24.2. *Methods of Planting*

23.24.2. **How to plant your trees.** *For. Publ. Ohio agric. Exp. Sta.* No. 16, [1940?]. pp. 6.

A popular, illustrated pamphlet.

23.24.2. SPITZENBERG, G. K. Die trichterförmig erhöhte Schutz- und Wasserfangscheibe. **[The funnel-shaped, raised, protective and water-trapping mound.]** *Forstarchiv* 16, 1940 (78–82). [G.] R.M.I.

Details are given of the correct method for planting seedling trees to ensure the protection of the roots and the use of rainfall to the greatest advantage.

23.24.4. *Time of Planting*

23.24.4 : 12.25 : 56.01. BALDWIN, H. I., and HOPKINS, G. M. **Course of seasonal height growth in summer planted White Pine.** *Fox Forest Notes* No. 25, 1941. p. 1.

White Pine transplants put out in mid-July showed a relatively short, steep height-growth curve, 95 per cent. of the seasonal growth being completed in 3 weeks, whereas normally 90 per cent. of the height growth takes place in the 4 weeks of June and the whole is completed in about 14 weeks. Available moisture supplies determined the occurrence of rapid growth of the stock planted in July, whereas normally in May air temperature is the significant factor, soil moisture being abundant.

23.26. Plant Rearing. Nursery Practice

23.26. MONTANA. **Annual nursery report, Savenac Nursery, calendar year 1939.** U.S.D.A. Forest Service, Washington, D.C. 1940. pp. 55.

Included in this report are descriptions and drawings of an improved transplanting board, which is easy to make, light, durable, and holds the transplants in place, and also of an effective tool for root-pruning bundled trees to the right length for field planting.

23.26.1 : 11.41.3.: 07.7. STOECKELER, J. H., and AAMODT, E. **Use of tensiometers in regulating watering in forest nurseries.** *Plant Physiol.* 15, 1940 (589–607). [Lake States Forest Exp. Sta.] O.B.D.

Constructional details are given of several types of tensiometers designed to measure soil moisture in conifer nurseries in the Lake States, and sample records are presented to show the actual performance of two of these instruments over 3–4 months in two different nurseries. Field and laboratory calibration techniques are described. The capillary potential of soil, and hence the calibration curves obtained, are shown to vary with the texture of the soil and the amount of organic matter present. Separate calibration is therefore necessary for each soil, and the instrument must be re-calibrated if heavy applications of organic matter are made to the soil. The practical values of such instruments in nursery watering practice are:—(i) to show the minimum permissible moisture content of the beds, below which injury or death of the trees will occur; (ii) to aid in regulating moisture, especially during hardening of the stock against drought and frost; and (iii) to guard against excessive watering, which is expensive and wastes soluble fertilizers.

23.26.3. SCHMID, F. A. F., and NUTMAN, F. J. **A convenient method for the excavation of growing trees in undisturbed soil.** *Soil Sci.* 49, 1940 (411–6). [East African Agricultural Research Station, Amani, Tanganyika Territory.]

A method, using cheap and simple equipment, is described whereby blocks of undisturbed soil of any reasonable size can be excavated and removed intact. *Authors' summary.*

23.26.3 : 12.25. IOWA. **Report on agricultural research for the year ending 30th June, 1940. Pt. I. Project reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames. [1940?]. [Forestry Section pp. 184–8.]

Scotch, Jack and Austrian Pines grew well after fall transplanting while Ponderosa Pine did not survive this treatment (p. 186).

23.3. *Afforestation*

23.3. (489). MORTENSEN, R. Plantningssagen i Vejle Vesteregen 1889–1939. **[Afforestation in Western Vejle 1889-1939.]** *Hedeselsk. Tidsskr.* 60, 1939 (54–70, 91–7). [Da.] Biol. Abs. 14 (16720).

23.3 : 23.52 : 12.26–8 : 11.62.11 : 11.47.2. KOHNKE, H. **The Black Alder as a pioneer tree on sand dunes and eroded land.** *J. For.* 39, 1941 (333–4). [Soil Conservation Service.]

Experience with *Alnus glutinosa* in reforestation of waste land in Germany suggests that this or other species of Alder should be tested for reclamation work in the United States. Particularly valuable properties of these species include (*a*) the ability to take up atmospheric nitrogen, (*b*) tolerance of acid soils, and (*c*) development of a rich foliage.

24. TENDING OF STANDS AND TREES

24.4. *Shelterbelts. Windbreaks*

24.4 : 21.62. DENUYL, D. **The effect of natural pruning on the protective value of a windbreak.** *J. For.* 39, 1941 (335–6). [Purdue University.]

Natural pruning up to one-half the height of the trees in the interior of the windbreak caused only a slight reduction in its effectiveness as measured before pruning started. The two outer rows of trees maintained their outside green foliage and thus continued to be effective in reducing wind velocity.

24.4 : 60. IGNAT'EV, S. N. **Shelterbelts and the productivity of perennial grasses.** *Dokl. vsesoyuz. Akad. s.-kh. Nauk* 1940 (3), (9–13). [R.] A.P.B.

In experiments in the Voronezh region the hay yield of shelterbelt-protected 1- to 3-year-old *Medicago* and *Agropyrum* was twice to four times higher than in the open steppe.

24.5. *Pruning*

24.51. DESLAURIERS, T. La taille des arbres. **[The pruning of trees.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 29. [F.]

24.51 : 12.25 : 56. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Further data confirm the conclusion that the pruning of up to half the living crown length of the coniferous species measured causes only a small and temporary loss in height and diameter increment (p. 22).

24.51 : 12.25. ROMELL, L.-G. Kvistningsstudier å tall och gran. **[Studies on pruning in Scots Pine and Norway Spruce.]** *Medd. Skogsförsöksanst. Stockh.* 32, 1940 (143–94). [Sw.e.]

A detailed report is presented on a study of the course of occlusion in about 3,000 knots in pruned and unpruned Scots Pine and about 1,200 in pruned Norway Spruce. The period of occlusion in both pruned and unpruned trees (comprising in the latter case the period of natural pruning) varied with size of knot and with rate of growth as judged by the breadth of annual rings in the stem at pruning height. Variation with ring breadth was so wide that it would be meaningless to speak of any definite period of occlusion, even for knots of a given size and position. A more constant—and more practical—factor was the thickness of wood laid down during occlusion. Even in the same tree and with a definite knot size and ring breadth at pruning height, healing varied widely throughout from knot to knot, indicating that the process of occlusion after pruning or natural pruning is a prolonged one, whether in an individual tree or in the stand as a whole. For this reason any practical measure of the rate of healing must be tied to some definite percentage of healed knots. Clear wood is not formed immediately after pruning, and in estimating the diameter of the knotty core an additional allowance—varying with knot size, rate of growth, species, and type of pruning (dry or green)—must be made for occlusion defects. When such allowances are made it appears that in particularly favourable cases and under ideal pruning conditions clear wood should be laid down in dry-pruned Scots Pine at a diameter $1\frac{1}{2}$ in. greater than that of the stem at pruning time. In general, however, even with carefully executed pruning, this figure will be at least 2–$2\frac{1}{2}$ in. For Spruce the extra diameter necessary is probably in the neighbourhood of $1\frac{3}{4}$ in. From a comparison of dry pruning and natural pruning in Pine it is concluded that well executed pruning, done as soon as the branch is dead, should give a gain in clear wood all round the defective core of at least $\frac{3}{4}$–1 in., in some regions $1\frac{1}{2}$ in. and more, but nowhere as much as 2 in. It was not possible to make such a comparison for Spruce, as no suitable unpruned material was available. With green pruning, both of Pine and Spruce, healing took place more rapidly than with dry pruning. No particular support was found

for the claim that Spruce is far more susceptible than Pine to rot after green pruning, but further study is needed on the risk of both fungus and insect attack. As to the season of green pruning, the findings in the present study agree with those of previous workers in showing that late winter and early spring are the best.

24.51 : 12.25. SCHMIED, H. Dringlichkeit der Fichtenastung. **[Urgency of Spruce pruning.]** *Wiener allg. Forst- u. Jagdztg.* 57, 1939 (59–61). [G.] Forstl. Rundsch. 12 (18). H.S.B.

Dry pruning should be done during the dormant period, should begin at 9 cm. d.b.h., and be repeated till the stems are clear to about 8 m. height. 600–800 stems per ha. should be pruned.

24.51 : 12.25. KIRCHHOFF. Zu: 'Neues Verfahren zur Erziehung astreinen Kiefernholzes'. **[On 'A new method of raising Pine timber without knots'.]** *Forstarchiv* 16, 1940 (130). [G.] R.M.I.

The results of the author's experiments on the production of clear Pine timber by removal of the lateral buds were thoroughly unsatisfactory owing to the abnormal development of buds and the susceptibility of the plants to certain pests. [Cf. *For. Abs.* 2 (139).]

3. FOREST UTILIZATION. FOREST TECHNOLOGY.

31. PROPERTIES AND ANATOMY OF WOOD

31.0. *General Information on Woods*

31.0 (71.4). **Commercial woods of the Province of Quebec.** Forest Products Bureau, Department of Lands and Forests, Quebec. 1939. pp. 41.

Brief notes on the important Canadian woods used in manufacture, together with tables giving weights, calorific values, hardness, strength and shrinkage tests of the woods, converting factors, and surface, volume and linear measures in use.

31.0 : 12.25. **Properties of Australian timbers: King William Pine (*Athrotaxis selaginoides* D. Don).** *Mon. News Lett. Div. For. Prod. Aust.* No. 109, 1941 (4).

31.0 : 12.25. **The properties of Australian timbers: Celery-top Pine (*Phyllocladus rhomboidalis*).** *Mon. News Lett. Div. For. Prod. Aust.* No. 107, 1940 (4).

31.0 : 12.26–8. **The properties of Australian timbers: Forest Red Gum (*Eucalyptus tereticornis* Sm.).** *Mon. News Lett. Div. For. Prod. Aust.* No. 110, 1941 (6).

31.0 : 12.26–8. **The properties of Australian timbers: Hickory Ash (*Flindersia ifflaiana* F. v. M.).** *Mon. News Lett. Div. For. Prod. Aust.* No. 108, 1941 (2).

31.0 : 12.26–8 (95). D'EISPEISSIS, J. L. **The chief characteristics and uses of six New Guinea timbers.** *Aust. For.* 5, 1940 (81–4).

Notes on Laup or New Guinea Walnut (*Dracontomelon mangiferum* Blume), Erima (*Octomeles sumatrana* Miq.), Irotu (*Calophyllum* sp.), Kuila (*Afzelia bijuga* A. Gray, syn. *Intsia bijuga*), Kamarere (*Eucalyptus deglupta*), and Taon (*Pometia pinnata* Forst.). The first-named species comprises the bulk of the timber at present exported and is now creating a considerable amount of interest, for veneer purposes, in Great Britain, the U.S.A., and Australia.

31.1. *Structure. Anatomy. Identification*

31.1 : 12.14.2. VESTAL, P. A. **Wood anatomy as an aid to classification and phylogeny.** *Chron. bot.* 6, 1940 (53–4). [Harvard University.] O.B.D.

A brief general statement of the value of wood anatomy as an aid to classification and the establishment of phylogenetic relationships. Phylogenetic systems should be based on all known characters, and it is pointed out that the anatomical study of tissues other than the secondary xylem of the stem offers further possibilities in this direction.

31.1 : 12.14.2 : 12.26–8. BARGHOORN, E. S. **The ontogenetic development and phylogenetic specialization of rays in the xylem of dicotyledons. I. The primitive ray**

structure. *Amer. J. Bot.* 27, 1940 (918–28). [Harvard University, Cambridge, Mass.] O.B.D.

Studies by previous workers have shown that the heterogeneous I condition, characterized by the presence of large heterogeneous multiseriate rays and conspicuously high-celled uniseriate rays, is primitive in the rays of the mature secondary xylem of dicotyledons. The present study of numerous structurally primitive dicotyledons shows that in the least modified ray condition there are likewise multiseriate and uniseriate rays extending from the outer margins of the primary xylem. Many of the lower vascular plants also possess both heterogeneous multiseriate and high-celled uniseriate rays in the innermost as well as in the outermost secondary xylem. There is substantial evidence to indicate that multiseriate rays in the dicotyledons do not originate phylogenetically by the widening of uniseriate rays but, as in the lower vascular plants, extend outward from the primary body. In stems of structurally primitive forms the multiseriate rays originate in the interfascicular segments of the stele, while the uniseriate rays extend from the fascicular segments. In roots the multiseriate rays arise opposite the strands of primary xylem, while the uniseriate rays extend from the intervening parts of the primary body. The term primary ray is proposed to designate rays which arise in contact with the primary body, the rays themselves being structures of the secondary body. All rays arising in the cambium as a result of secondary growth are referred to as secondary rays. The cellular development of both types of primary and of secondary rays is essentially similar in cytological details. Discussion of ray ontogeny in this study is restricted to its more fundamental aspects. The development of specific ray structures may frequently involve complex cytological changes in the cambial initials. More or less extensive variations in the structure of rays are normally produced during their ontogeny in the secondary xylem. The phylogenetic modification of rays, however, is achieved by consecutive series of increasingly modified ontogenies. *From author's summary.*

31.1 : 12.25. BETHEL, J. S. **The effect of position within the bole upon fiber length of Loblolly Pine (*Pinus taeda* L.).** *J. For.* 39, 1941 (30–3). [Pennsylvania State Forestry School, Mount Alto.]

The results of this study agree with Sanio's first two laws, which relate the size of the fibre to its position in the bole of the tree, in both horizontal and vertical planes, and also agree with the findings of other investigators that the maximum fibre length occurs progressively higher up the tree with increase in age.

31.1 : 12.25–8 (73) : 31.0 : 31.2 : 31.4 : 31.8 : 12.11.23. BROWN, H. P., and PANSHIN, A. J. **Commercial timbers of the United States: their structure, identification, properties, and uses.** McGraw-Hill Publishing Co., New York and London. 1940. pp. 554.

On the title page it is stated that this volume was 'published formerly under the title *Identification of the Commercial Timbers of the United States*', suggesting that it is merely a second edition of the work that appeared in the same Series in 1934. In the preface, on the other hand, the book is claimed to be the first edition of a new book to replace the old. In point of fact the present work appears to be both. The first half of the book, which is concerned with general wood anatomy, may be regarded as an entirely new production, but the second half, containing keys for the identification of the woods of the U.S.A. and descriptions of the species, is almost identical with the corresponding part of the 1934 book. It is almost exactly double the size of the one it succeeds and the additional matter gives it both a balance and a wider scope that have converted what was a publication of local interest into a general textbook, though there are still limitations that may slightly reduce the width of its appeal.

The work has been designed as a readable book for use primarily by students of forestry and botany, and the method of presentation chosen for the wood anatomy—that of describing a single species in detail before discussing the variations to be found in other woods—has been adopted with that particular object in view. For similar reasons an introductory chapter on the 'gross features' of wood, such as growth rings, heartwood, etc., is given early in the book, though this necessitates a fuller discussion of some of these features at a later stage in the book. The sequence and treatment adopted give the book an individual character and appear to be admirably suited to the purpose in view, though it must be confessed that they make the work rather awkward as a book of reference.

A suitable botanical perspective is achieved by introductory chapters on 'The Plant Origin of Wood' and 'The Tree'. The former includes outlines of the types of plant producing wood and plant classification, and the factors controlling the selection of a commercial wood; 'The Tree' includes an account of the parts and growth of trees and the development of the tissues of the mature trunk from those originating in the young shoot. The two succeeding chapters on 'The Woody Plant Cell' and 'The Cambia of Trees' should prove very useful to the student. The former includes the development of the cell wall and pitting and a clear account of the modern conception of the nature of the cell wall, based mainly on the work of Bailey, Kerr and Ritter. The types of cambial cell and their methods of division are well described, except that the growth in size of individual rays and the ways by which the number of rays may be increased are barely mentioned, though both have an important influence on the ray features characteristic of mature wood.

The succeeding hundred pages or so are devoted to the anatomy of secondary wood, starting with that of the softwood. As has been indicated above, the method adopted has been to proceed from the specific to the general and the descriptions of White Pine and Red Gum, which serve as specific examples of the structure of softwoods and hardwoods respectively, are based on macerated material as well as on sections, and are well illustrated by drawings and photomicrographs. This section of the book is nine-tenths or more of a general account of wood anatomy and it is disappointing to find that it is just not a complete account owing to the omission of certain features because they happen not to occur in any U.S.A. timbers. The examples, too, in the text and tables and the illustrations are drawn almost exclusively from U.S.A. woods. Perhaps it is unfair to complain that the authors, writing about U.S.A. timbers for U.S.A. students, should largely exclude tropical timbers, but such a little more would have been needed to complete the picture that one cannot help regretting the limits imposed.

The last chapter before the keys is a miscellany of information on aspects of wood that have not been included or fully described elsewhere in the book. It covers a wide range of subjects such as traumatic tissues, the relation between structure and properties, figure and defects. The treatment appears rather uneven from a European viewpoint, seeming to depend largely on the amount of American work that has been published on each subject. For example, compression wood is dealt with at length on the basis of Pillow and Luxford's bulletin on this subject, but tension wood is referred to only in a footnote. Perhaps this apparent unevenness may be partly explained by the different importance attached to the various features in the United States.

The keys and descriptions, which account for over two hundred pages, are almost identical with those of the preceding volume, except that the descriptions now include notes on the principal uses of the timbers, an indication of what structural features can be associated with these uses, and a select list of references for each species. The illustrations are admirable and are very conveniently interspersed in the text of the keys. Indeed, the illustrations throughout the book deserve the highest praise both for their appropriateness and as examples of highly skilled photomicrography. A full glossary is included at the end of the book.

L. CHALK.

31.1 : 12.26–8. RUNKEL, R. Zur Kenntnis der Zellwände tropischer Laubhölzer. **[On the cell walls of tropical hardwoods.]** *Wbl. Papierfabr.* 71 (9), 1940 (93–102). [G.] [Reichsinstitut für ausländische und koloniale Forstwirtschaft, Tharandt.] P.O.

31.1 : 12.26–8. TIPPO, O. **The comparative anatomy of the secondary xylem and the phylogeny of the Eucommiaceae.** *Amer. J. Bot.* 27, 1940 (832–8). [University of Illinois, Urbana.] O.B.D.

The wood anatomy of *Eucommia ulmoides*, the sole representative of the family Eucommiaceae, was found to resemble that of the Ulmaceae rather than that of the Hamamelidaceae. It is concluded that the phylogenetic position of the Eucommiaceae is near the Ulmaceae in the order Urticales, and flower structure and characteristics of external morphology are said to support this view. The suggestion is made that the Hamamelidaceae gave rise to the Urticales and that the Eucommiaceae form a link between the two groups.

31.1 : 12.26–8 (81). COCKRELL, R. A. **A comparative study of the wood structure of several South American species of *Strychnos*.** *Amer. J. Bot.* 28, 1941 (32–41). [University of California, Berkeley.] O.B.D.

Detailed descriptions are given of the wood anatomy of 26 Brazilian species of *Strychnos* and characters that proved distinctive enough for use in identification are discussed. Many of the species were found to be too similar for identification by their anatomical features, but a key is provided to show how far they are separable by such means.

31.1 : 12.26–8 (7 : 8). RECORD, S. J., and HESS, R. W. **American woods of the family Verbenaceae.** *Trop. Woods* No. 65, 1941 (4–21).

Descriptions of the woods of the various genera, with brief notes on uses, common names, and distribution.

31.1 : 33.15. GALLAY, Ya. S. **The structural analysis of 'improved' woods (lignography).** *Lesokhim. Prom.* (9), (20–6). [R.r.] L.S.

Owing to the internal stresses prevailing in 'improved' woods, their structure is obliterated in the preparation of thin sections for microscopic study. To obviate this difficulty, the following technique was elaborated at the Central Forest Chemistry Research Institute (TsNILKhI):—A specimen of, say, 20 × 20 × 20 mm. is cut and the face to be studied is polished, first with emery papers of gradually decreasing coarseness, and then by means of a well-wetted cloth wheel revolving at high speed. The face thus prepared is studied under the microscope (enlargement up to × 600–900) using reflected light. By this method the structural characteristics of a number of 'improved' woods—chiefly Lignostones—were studied and compared with the frictional resistance of these materials.

31.2. *Physical Properties*

31.2 : 12.25. STOJANOFF, W. **Investigations on the wood technology of the Bulgarian Pine, *Pinus peuce* Grisb.** Vorträgesammlung, Bibl. Lessowodska Missal No. 4, 1939 (3–22). [Bulg.g.] Forstl. Rundsch. 12 (223). H.S.B.

Includes a table of physical and mechanical properties.

31.21. Texture. Grain

31.21.31 : 12.26–8 : 2 : 33.03. KRAHL-URBAN, J. **[Investigations on the annual-ring structure of Oaks in the Prussian forest district of Freienwalde.]** J. Neumann, Neudamm. 1939. [G.] Forstl. Rundsch. 12 (92). H.S.B.

In relation to requirements for use as veneer logs and appropriate silvicultural treatment.

31.22. Relation to Water, Air, Gases

31.22.2 : 31.22.1 : 31.27 : 12.25. BARKAS, W. W. **Wood water relationships. IV. The swelling and shrinkage of wood in relation to its mechanical properties.** *Repr.* from *Trans. Faraday Soc.* 35, 1939 (388–96). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The shrinking and swelling, or 'working' as it is called, of Sitka Spruce wood is measured under practically stress-free conditions. It is found that below about 15 per cent. moisture content the process is reversible with moisture content, whereas between 15 per cent. and saturation, i.e. in the region where capillary sorption is appreciable, hysteresis appears. A picture of the 'working' process is presented which agrees with these observations and which can be tested against independent evidence. In the region of capillary sorption it appears that the resistance offered by wood to shrinkage stresses, which are given by Katz' swelling pressure equation, is identical with that offered to external hydrostatic pressures applied mechanically, a result which does not appear to have been previously established. *Author's summary.*

31.22.2 : 31.22.1 : 31.27 : 12.25. BARKAS, W.W. **Wood-water relationships. V. The hydrostatic compressibility of the wood-water aggregate.** *Repr.* from *Trans. Faraday Soc.* 36, 1940 (824–34). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Making use of an empirical observation on the change of vapour pressure of solutions with pressure, as calculated by Porter's osmotic pressure equation, it has been found possible to calculate the specific volume of water in tension. Assuming that the above observation is equally applicable to hygroscopic gels, complete (pressure : volume) curves for the wood-water aggregate of Sitka Spruce at all moisture contents have been constructed, covering a wide range of pressures and tensions. The results are compared with those obtained

on the saturated aggregate by Volbehr, who used a method of calculation which did not involve a knowledge of the vapour pressure. *Author's summary.*

31.27. Mechanical Strength

31.27 : 12.25 : 33.51. STOJANOFF, W., and TAMAMDSCHIEFF, L. **Comparative tests of the properties of Pine and Spruce pitprops of different origin.** *Lessowodska Missal* 8, 1939 (5–6, 259–64). [Bulg.g.] Forstl. Rundsch. 12 (227). H.S.B.

A comparative table is given of the strength properties of Bulgarian, Rumanian and Yugoslavian pitprops of Pine and Spruce.

31.27 : 12.25. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

It has been found that static bending tests on specimens of *Pinus insignis* 1½ in. by 1½ in. and 2 in. by 2 in. in cross section give equally reliable values while those on specimens 1 in. by 1 in. in cross section are erratic (p. 26).

31.27 : 12.26–8 : 31.0. **Timber tests: Merawan Meranti (*Hopea sulcata* Sym.).** *Malay. For.* 10, 1941 (29–34).

A notable feature of this timber is that it is stronger than other timbers of approximately equal weight. In comparison with Teak, it is slightly less heavy, but is stronger as a beam and joist, stronger in shear, equal in shock-resisting ability, and slightly less hard. It is undoubtedly suitable for all forms of building construction and could be used for heavy constructional work. It would be necessary, however, to protect it from termites if timber were expected to last a long time when exposed to attack. It possesses considerable resistance to fungal attack. When treated with creosote or diesel-oil mixture, even if the absorption is comparatively low, this timber lasts very well and has so far proved a successful sleeper wood.

31.27 : 31.22.1 : 11.11. KOLLMAN, F. Die mechanischen Eigenschaften verschieden feuchter Hölzer im Temperaturbereich von – 200 bis + 200° C. **[The mechanical properties of woods of different moisture content over the temperature range – 200 to + 200° C.]** *VDI-Forschungscheft* No. 403, 1940. pp. 20. *Abstract* in *Allg. Forst- u. Jagdztg.* 117, 1941 (125). [G.]

The modulus of elasticity decreased less with the moisture content at very low temperatures than at + 20° C. The crushing strength of dried wood showed a linear correlation with temperature. A calculation was made of the linear heat expansion of Spruce wood for the range – 190° to + 20° C. The curve for moisture content in relation to crushing strength in frozen wood had two peaks, which agrees with theoretical considerations. The bending strength of frozen water-saturated wood was found to be twice as great as that of the same wood at room temperature. In frozen wood, impact work to failure clearly decreased with the moisture content within the hygroscopic range.

31.27 : 33.53 : 12.26–8. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Breaking tests on 17-year-old *Eucalyptus paniculata* show equal strength for poles of seedling and coppice origin, grown in a given locality and of equal age, taper and tip diameter (p. 26).

31.3. *Chemical Properties*

31.3. CAMPBELL, W. G., and BRYANT, S. A. **Determination of pH in wood.** *Nature, Lond.* 147, 1941 (357). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Preliminary note on a method evolved at the Forest Products Research Laboratory at Princes Risborough. The pH of the water used to extract a sample of wood flour is so adjusted beforehand that it undergoes no change when mixed in any proportion with the wood substance at room temperature: the pH of the extract is then numerically equal to that of the moisture of condition of the wood, even when the wood does not exert a strong buffering action.

31.3. GLADING, R. E. **The ultraviolet absorption spectra of lignin and related compounds.** *Paper Tr. J.* 111 (23), 1940 (32–9). [West Virginia Pulp and Paper Co., Luke, Md.] P.R.

31.3. HARRIS, E. E. **Hydrogenation of lignin.** *Paper Tr. J.* 111 (24), 1940 (27–8). [Forest Products Laboratory, Madison, Wis.] P.R.

Experiments in hydrogenation of lignin in dioxane and in aqueous suspensions in the presence of an appropriate catalyst are discussed. Hydrogenation of lignin in dioxane yields propyl-cyclohexane derivatives. Insoluble lignin obtained from wood by hydrolysing the carbohydrates with acid gave similar hydrogenation products. *Author's summary.*

31.3 : 12.25. SHARKOV, V. I., and GIRCHITS, A. L. **The chemical composition of wood. 6. On the chemical composition of the [spring] wood layer adjoining the cambium in Pine and Spruce.** *Lesokhim. Prom.* 1940 (6), (2–7). [R.] L.S.

31.3 : 12.25 : 12.11.11 : 12.14.8. SHARKOV, V. I. **On the mechanism of the formation of polysaccharides in the wood of Pine. 5.** *Lesokhim. Prom.* 1940 (5), (9–13). [R.] L.S.

The chemical reactions involved in the formation of polysaccharides from the carbohydrates in the sap of the inner bark are discussed.

31.3 : 12.25 : 12.26–8. SHARKOV, V. I., and MUROMTSEVA, V. **The chemical composition of wood. 4. On the chemical composition of Pine and Birch wood.** *Lesokhim. Prom.* 1940 (4), (3–7). [R.] L.S.

31.3 : 12.26–8 : 12.11.11 : 12.14.8. KESSEL, S. L. **[Trace elements in the wood and bark of Karri and Jarrah.]** *Aust. For.* 5, 1940 (114–5).

31.3 : 31.1 : 33.32. DADSWELL, H. E., and ELLIS, D. J. **Contributions to the study of the cell wall. 3. The fibre-bonding materials and their importance in pulping.** *Repr. Div. For. Prod. Aust.* No. 74, 1940. pp. 11. [*Repr.* from *J. Coun. sci. industr. Res. Aust.* 13, 1940 (290–8).]

Both lignin and another material are concerned in the bonding together of wood fibres. The non-lignin bonding material can be removed by sodium hydroxide solutions both before and after delignification, but both this material and the lignin must be removed before the fibres will separate.

31.3 : 31.1 : 33.32 : 12.26–8. MACKNEY, A. W. **An attempt to isolate the fibre-bonding material from the holocellulose of *E*[*ucalyptus*] *regnans* F.v.M.** *Repr. Div. For. Prod. Aust.* No. 75, 1940. pp. 6. [*Repr.* from *J. Coun. sci. industr. Res. Aust.* 13, 1940 (299–304).]

A preliminary attempt at the fractionation of holocellulose has indicated that there is present in the holocellulose a non-furfural-yielding fraction to the extent of 2·8 per cent. An argument is developed to show that this fraction may be the non-lignin, fibre-bonding material. *Author's summary.*

31.4. *Durability. Decomposition*

31.41. Natural Durability

31.41 : 12.26–8. GOLD COAST. **Report on the Forestry Department for the year 1939-40.** Govt. Printing Dept. (Publications Branch), Accra. 1940. pp. 8.

After 3 years' test in a 'graveyard' the species most resistant, of those tested, were *Mimusops heckelii*, *Ongokea klaineana* and *Sarcocephalus diderrichii*, while *Chlorophora excelsa* and *Terminalia ivorensis* were attacked by fungus and *Lophira alata* suffered severely from termites (p. 4).

31.42. Attack by Plant Organisms

31.42.11 : 12.26–8 : 12.21 : 44.3. BARSAKOFF, B. **The behaviour of the tinder fungus (*Polyporus fomentarius* L.) in Beech (*Fagus sylvatica* L.).** *Lessowodska Missal* 8, 1939 (105–14). [Bulg.g.] Forstl. Rundsch. 12 (224). H.S.B.

With reference to the behaviour of the fungus in dead and living wood.

31.42.11 : 31.24 : 31.3. STEINMETZ, F. H., and HILBORN, M. T. **A comparative study of the chemical composition and calorific value of decayed cordwood.** *Abstract* in *Phytopathology* 31, 1941 (22).

Previous work showed that the calories per gram of decaying wood decreased faster than the decrease in specific gravity, indicating that all the wood components are not alike in calorific value. Chemical analysis of decaying wood shows, however, that all the principal wood components decrease similarly as decay proceeds.

31.42.11 : 31.3. FINDLAY, W. P. K. **Effect of addition of sugar on rate of decay of wood.** *Repr.* from *Ann. appl. Biol.* 28, 1941 (19–22). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

It was found that there is no significant difference in the amount of decay between samples treated with 0·5 or 1·0 per cent.

sucrose or with 1 per cent. dextrose, and controls treated with water. The loss in weight of samples treated with 5 per cent. sucrose or 2·5 per cent. dextrose was less than that of the controls, but if allowance be made for the whole of the weight of sugar added, the total loss was slightly greater than that of the controls. It is believed that a larger proportion of such loss is due to destruction of the sugar and that the destruction of wood substance is less in the presence of large amounts of readily available sugars, which are utilized by the fungus in preference to the more refractory polysaccharides in the wood. *Author's summary.*

31.42.11 : 31.3 : 12.25. HUNGATE, R. E. **Nitrogen content of sound and decayed coniferous woods and its relation to loss in weight during decay.** *Bot. Gaz.* 102, 1940 (382–92). [University of Texas, Austin.] O.B.D.

(i) A satisfactory method for the determination of total nitrogen in wood is described. (ii) Determinations of specific gravity and nitrogen content for sound and decayed woods indicate that there is little change in the total nitrogen of wood during decay. (iii) Comparisons between the amount of wood disappearing during decay and the maximum amount of nitrogen available indicate that the amount of wood is 500–700 times as great as the total nitrogen available. (iv) Considerations of the effects of added nitrogen indicate that the nitrogen present is utilized more effectively during decay than is that added. (v) The efficiency of certain fungi in utilizing nitrogen may explain in part their great success in destroying wood. *Author's summary.*

31.42.12 : 31.27 : 31.23 : 12.25 : 12.21. CHAPMAN, A. D., and SCHEFFER, T. C. **Effect of blue stain on specific gravity and strength of Southern Pine.** *J. agric. Res.* 61, 1940 (125–33). [Bureau of Plant Industry, U.S.D.A.] O.R.E.

The effect of blue stain on the specific gravity and strength of Pine wood inoculated with pure cultures of 4 species of fungi [*Ceratostomella pilifera*, *C. pini*, *C. ips*, and *Graphium rigidum*] was essentially the same as reported for prior, similarly controlled studies [*J. agric. Res.* 47, 1933 (369–74)]. Although all strength properties appeared to be lowered generally, only toughness was affected to an extent of general practical importance. The different species of fungi did not affect the wood with equal severity, nor was their relative order in this respect entirely the same for all properties tested. There was some evidence of a broad relation between the abundance of direct cell-wall penetration by the fungi and reduction in toughness. The intensity of discoloration caused by the different fungi was not indicative of the severity of attack nor of the comparative weakening caused by each. The frequency of association between a particular blue-stain fungus and a certain kind of wood apparently does not necessarily indicate the inherent ability of the fungus to attack the wood and to affect its strength. *From authors' summary.*

31.43. Attack by Animal Organisms

31.43 : 13.2 : 12.26–8. BURMA. **Report on forest administration in the Utilization Circle, for the year ended the 31st March, 1940.** Supt., Govt. Printing and Stationery, Rangoon. 1940. pp. 45.

Tests of *Dipterocarpus* spp. for marine borer, made by the Forest Research Institute, Federated Malay States, showed the wood to be severely damaged after 2½ years (p. 18).

31.43 : 13.2 : 13.11. PARKIN, E. A. **The digestive enzymes of some wood-boring beetle larvae.** *Repr.* from *J. exp. Biol.* 17, 1940 (364–77). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Qualitative tests for the presence of amylase, invertase, maltase, lactase, cellulase, hemicellulases A and B, and proteinase in the digestive juices of wood-boring coleopterous larvae are described. Fourteen species representing the families Scolytidae, Cerambycidae, Lyctidae, Bostrychidae and Anobiidae, have been investigated and their nutrition is discussed in terms of the enzymes found and present knowledge of the composition of wood.

It is concluded that three types of wood feeding may be distinguished, (i) larvae able to utilize only the cell contents and perhaps part of the polysaccharides which are intermediate in composition between starch and the hemicelluloses—Lyctidae and Bostrychidae, (ii) larvae able to utilize cell contents and the carbohydrates of the cell wall up to hemicelluloses, but excluding cellulose—Scolytidae (bark beetles), and (iii) larvae able to utilize cell contents and the carbohydrates of the cell wall

including cellulose—Anobiidae and most Cerambycidae.

A proteinase is of general occurrence in the larval guts of wood-boring beetles. Digestive enzymes were absent from the gut of hibernating larvae of *Scolytus destructor*. *Author's summary.*

31.43 : 13.2. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

The beetle *Ernobius mollis* was found in stocks of seasoned and seasoning wood and is believed to have been imported from Scandinavia (p. 14).

31.43 : 13.2 : 13.15. YASHIRO, H. **On the life-history of *Stromatium longicorne* Newm.** *Bull. Okinawa For. Soc.* No. 1, 1940. pp. 1–10. [Jap.] R.A.E. A29 (103).

S. longicorne, all stages of which are described, is common in the Loochoo Islands, where it attacks furniture and structural timber. The damage is worst in seasoned timber and in some kinds of wood is practically confined to such material.

31.43 : 13.2 : 12.26–8. MILLER, N. C. E. **Drywood termite attack on Sepetir.** *Malay. For.* 10, 1941 (23–5). [Department of Agriculture, Straits Settlements and Federated Malay States.]

From the test described it appears that Sepetir (*Sindora* spp.) wood, whether sapwood or heartwood, is not particularly palatable to *Calotermes domesticus*. In an editorial footnote it is pointed out that this conclusion is not supported by empirical data collected by the Malayan Forest Department.

31.45. Injury by Fire

31.45 : 38.2 : 33.4. LELY, W. G. **Fire-resisting doors.** *Wood* 6, 1941 (40–1).

Critical comment on an article by A. H. Barnes [cf. *For. Abs.* 2 (304)]. The fire-resisting qualities of Teak are emphasized.

31.8. *Defects of Timber*

31.8 : 04.5. GREGORY, J. N. **X-rays and timber defects.** *Repr. Div. For. Prod. Aust.* No. 76, 1940. pp. 3. [*Repr.* from *J. Coun. sci. industr. Res. Aust.* 13, 1940 (310–2).]

Most major defects in the logs examined could be observed on X-ray photos, and termite cavities could be distinguished from decay pockets. A Bucky grid appears to be useful for improving the clearness of X-ray negatives. [Cf. *For. Abs.* 2 (153, 303).]

31.8 : 12.26–8 : 31.2. TSCHERNAEFF, P. **Red or false heart of Beech (*Fagus sylvatica*) in Bulgaria.** *Lessowodska Missal* 8, 1939 (84–104). [Bulg.g.] Forstl. Rundsch. 12 (223). H.S.B.

Effect on specific gravity and mechanical strength.

31.8 : 31.1 : 12.25. DOUGLASS, A. E. **Examples of spiral compression wood [in Spruce from Sweden and Alaska].** *Tree-Ring Bulletin* 6, 1939–40 (21–2).

31.8 : 31.1 : 33.36.3. TIEMANN, H. D. **Collapse in wood as shown by the microscope.** *J. For.* 39, 1941 (271–82). [U.S. Forest Products Laboratory, Madison, Wis.]

Collapse, by which the cell walls are distorted or obliterated in the drying of green wood, is caused by 'the hygroscopic tension produced throughout the liquid water content of the cells by the menisci existing over small interstices in completely enclosing walls during evaporation'. The difference between collapse and normal shrinkage is noted. Wood collapsed for the first time frequently recovers its original form under proper conditions of humidity and temperature and such reconditioned material does not recollapse. Non-recoverable collapse occurs in some kinds of woods, notably Western Red Cedar and rarely in Douglas Fir and Yellow Poplar.

A method is explained of preparing sections of wood for photographing to show individual cells of collapsed and recovered wood, and plates are included with explanations to illustrate these conditions in specimens of Aspen, Oak, Western Red Cedar, Yellow Poplar and *Eucalyptus*.

31.8 : 32.81. IOWA. **Report on agricultural research for the year ending 30th June, 1940. Pt. I. Project reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames. [1940?]. [Forestry Section pp. 184–8.]

Detailed studies of sample timber trees showed that 8·5 per cent. of the total volume of merchantable trees was cull, that more than 60 per cent. of trees examined were defective in some way, that a high percentage of defects

could not be detected until the tree was felled and split, and that woodland grazing and poor silviculture had resulted in depreciation of woodlands examined (pp. 185–6).

32. HARVESTING OF WOOD. LOGGING

32 : 60.31 : 7. BRANDSTROM, A. J. F. **Economic problems in logging and timber management.** *Paper Tr. J.* 111 (23), 1940 (29–31). [Crown Zellerbach Corporation, Camas, Wash.] P.R.

With reference to the forests of the north-western United States.

32 : 76 : 66. KOROLEFF, A. **The role of forest utilization in forest management: efficiency of logging as a means for the promotion of sustained yield practice.** *Pulp Paper Mag. Can.* 42, 1941 (262–6). [Canadian Pulp & Paper Association.]

Discussion of the possibilities of promoting sustained yield forest management in North America by increasing the efficiency of logging methods.

32 : 81 : 12.26–8 (728.2). MILLER, W. A. **Mahogany logging in British Honduras.** *Carib. For.* 2, 1940–41 (67–72). [E.span.]

An account of the extraction system used by a large company operating in an area where Mahogany occurs at an average rate of one mature tree to every two acres. The extraction area is divided into mile squares by cruising lines 8 ft. wide.

32.1. *Marking of Trees and Coupes*

32.1 : 07.7. CRAIG, J. W. **Spring spray guns for marking coniferous plantations.** *J. For.* 39, 1941 (334–5).

Tree marking by means of paint applied from a spring spray gun was found to have advantages over the axe or scribe methods both in speed and ease of operation. [Cf. *For. Abs.* 1 (177).]

32.2. *Felling and Related Operations*

32.25 : 07.7. STENTZEL, E. Neue Geräte für den Hauungsbetrieb. [**New cutting tools.**] *Forstarchiv* 16, 1940 (17–28). [G.] R.M.I.

Descriptions of saws and sawing, of axes, knives, wedges and other tools, compiled from accounts in the literature.

32.25 : 07.7 : 81. KOOLS, J. F. Organisatie van het geregelde onderhoud van verdeelzagen. [**Organization of regular maintenance of logging saws.**] *Tectona* 34, 1941 (46–66). [Du.]

The author envisages as ideal conditions for a properly organized saw-maintenance service:— (i) Ownership of all saws by the management, which would hire them out to the sawyers. (ii) All skilled saw-maintenance operations to be done in one or more central workshops. (iii) Proper records to be kept of the number, value or condition, and whereabouts of the saws, and of work done in the repair shops. Detailed suggestions are made on these points and the technique of saw filing and setting is described.

32.4. *Inventory and Evaluation of Felled Timber*

32.4 : 52.43.2 : 81. HURLEY, P. J. **Settlement of wood hauled without rescale at landings.** *Pulp Paper Mag. Can.* 42, 1941 (27–8, 34). [Anglo-Canadian Pulp & Paper Mills, Ltd.]

In the method described each hauling road on the operation is numbered and the piles of wood on each road are numbered consecutively, the scaling being recorded by road and pile numbers. The first carbon copy of specifications of wood scaled is used to make up a hauling register. The bolt of wood from each pile bearing pile number, road number and dimensions should be piled separately at the landing space and marked by a special number so that it can readily be identified with the haulier.

32.8. *Grading and Storage of Wood in the Rough*

32.81 : 12.26–8. BENSON, A. O. **Something new in hardwood log grades.** *J. For.* 39, 1941 (13–5). [Forest Products Laboratory, Madison, Wis.]

Advocates basing hardwood log grades on the percentage of clear-faced cuttings of specified minimum sizes, as in the present practice for grading hardwood lumber, rather than on the number and size of defects irrespective of their location. The application of this method is discussed. Standard grade specifications, based on defect-free areas, are being developed to apply to all species and all regions.

32.82 : 33.06. BALDWIN, H. I. **Roofing cordwood piles.** *Fox Forest Notes* No. 27, 1941. p. 1.

Heavy kraft paper impregnated with asphalt on one side and reinforced with burlap on the other appears to be a satisfactory cover for piled wood to prevent moisture absorption during rainy seasons and wood freezing together in winter, thus making the wood easier to handle and less liable to decay.

32.82 : 33.06. LÖVIS. Täckning av brännved. **[The covering of fuelwood.]** *Skogen* 27, 1940 (388). [Sw.]

Description of a rough and ready way, much used in Finland, of roofing fuelwood stacks. A single line of billets, laid end to end, is placed lengthwise along one side of the stack to give the required pitch to the roof, which is made of closely packed billets laid crosswise with cleft surface upwards. The roofing billets should be long enough to form eaves on the drainage side, so that the water falls clear of the stack.

32.9. *Transport*

32.9. HAFNER, F. Über die Anwendung aussergewöhnlicher Methoden und Anlagen für die Holzbringung einst und jetzt. **[On the application of unusual methods and installations for timber extraction in the past and present.]** *Cbl. gesamte Forstw.* 67, 1941 (59–70). [G.]

A survey of literature on unusal types of slides, of road transportation, of funicular railways, and of ropeways, and on maritime rafting, floating in specially built canals, and sled roads. 38 references are quoted.

32.9 : 33.02 : 07.7 : 81. TOWNSEND, C. L. **Practical pulpwood production.** ***Equipment and Supplies for Woodlands Operations***: extracts from the 1940 issue of *Pulp & Paper Manual of Canada*. pp. 5–17. National Business Publications, Ltd., Gardenvale, Que.

An account of the chief operations involved under the conditions prevailing in Eastern Canada. Considerable progress in the mechanization of logging has been achieved during the last decade, but often provision is still lacking for the proper care of mechanical equipment and for the preparation of records of the performance and life of machinery. Mechanization tends to make logging economically possible throughout the year; continuity of employment, once assured, will check the present decline in the efficiency of forest labour.

32.91.12 : 07.7. LATHROP, W. W. **Tractor and sulky skidding operation.** *Pulp Paper Mag. Can.* 42, 1941 (267–9). [James MacLaren Co., Ltd.]

Sulky logging appears to be a useful supplement to ordinary logging methods. Among the conclusions reached from this operation are: (i) That such an operation requires specially selected men throughout. (ii) It is necessary to have extreme traction without excessive vibration. (iii) The best cable equipment appears to be a $\frac{3}{4}$-in. main cable and two $\frac{3}{4}$-in. × 20 ft. or 25 ft. slings. (iv) The length of the poles hauled affects the efficiency of operation. (v) It pays to haul at night.

32.91.12 : 32.95. BEHIE, J. W. **Suggests new method of logging steep slopes.** *W. Cst. Lumberm.* 68 (2), 1941 (18, 20).

A counterbalance system in which two tractors equipped with arches are joined by a wire rope running through a bullblock at the top of the slope, a brake attachment being used as well on very steep slopes. The loaded tractor helps to pull up the empty tractor and arch, which in turn acts as a brake on the down-moving unit. Small donkeys and small rigging are used to yard direct to the counter-balance or to cheaply constructed lateral roads along which independent tractors take the logs to the counterbalance. The yarding distance is kept at about 500 ft. for each set-up.

32.91.21. ANDAMANS. **Report on forest administration for the year 1938-39.** Manager of Publications, Delhi. 1940. pp. 81.

Elephant tramlines have been found to be highly efficient in the extraction of logs from valleys (p. 10).

32.91.22 : 76.1. THOMPSON, W. G. **Motor truck hauling costs in Arizona and New Mexico.** *Timberman* 42 (5), 1940–41 (22–6). [U.S. Forest Service.]

The study is based on data from 1,620 trips of six sizes of trucks, including eleven different makes, hauling Ponderosa Pine logs over distances ranging from $4\frac{1}{2}$ to 40 miles. In general, trucks below a 2-ton capacity were inefficient and larger trucks were efficient only when they carried capacity loads and operated steadily, haulage at a moderate rate of speed being cheapest in such cases. The unit cost

of haulage was less when the load was heavy and travel slow than with a small load and fast travel, the difference in total trip time being relatively small. Haulage costs varied considerably with the quality of the roads.

33. CONVERSION AND PRESERVATION OF WOOD

33 : 22.88.2 (79.4). BOLLAERT, R. **A preliminary survey of utilization conditions for second-growth timber products from the western Sierra Nevada.** *Tech. Note Calif. For. & Range Exp. Sta.* No. 14, 1941. pp. 13.

Reports a decline in the use of second-growth lumber during the past few years and recent declines in the demand for mine poles and fuelwood from the second-growth region, while two secondary wood products, piling and veneer, show increasing production.

33 : 82 : 76. RAPRAEGER, E. F. **Employment per unit of forest product.** *Res. Note Nth. Rocky Mt. For & Range Exp. Sta.* No. 11, 1940. pp. 2.

Table giving average figures of the man-hours employed in manufacture per unit of various wood products.

33.0. *Utilization Categories of Wood*

33.02 : 32 : 76.1 : 60.31.2. JENSEN, V. S. **Cost of producing pulpwood on farm woodlands of the upper Connecticut River valley.** *Occ. Pap. Ntheast. For. Exp. Sta.* No. 9, 1940. pp. 17 + viii.

Tree size, more than any other single factor, determined the cost of producing peeled pulpwood from second-growth Spruce and Fir stands. Within the size range covered—4 to 13 in. d.b.h.—maximum output was obtained for all phases of an operation in handling the larger though not the largest diameter classes. In general, the one-man crew was more efficient than larger crews.

33.02 : 32.7 : 34.6 : 33.32. WHIPPLE, S. C., and PRICE, M. W. **The extent of and methods of reduction of waste in wood preparation.** *Pulp Paper Mag. Can.* 42 (2), 1941 (123–6). [Canadian International Paper Co.]

Wood loss during preparation at the mill may be due to woods operation, slasher operation, handling, storage or treatment in the mill itself. Factors responsible for such waste in woods and intermediate operations include: (*a*) High protruding knots, which make it necessary to run logs through barking drums more than once. (*b*) Storage of wood in woods and streams. (*c*) Cutting logs in odd lengths when a standard length has been specified. (*d*) Dynamiting. (*e*) Butt ends and saw kerf made in slashing. (*f*) 'Brooming' in barking drums. (*g*) 'Brooming' and breakage in dumping logs. (*h*) Deterioration in storage. The loss due to dirt and colour variations depends largely on the quality of the pulp being produced. Proper equipment should be used for cleaning wood and removing defects. Loss in sawdust at the chipper varies directly with chipper speed and is affected by the sharpness of the knives used.

33.06 : 33.19 : 33.7. PABLO. Vedhuggeri i stor skala. **[Large-scale conversion of fuelwood.]** *Skogen* 27, 1940 (369–70). [Sw.]

In view of the fuel shortage a special sawmill for converting firewood on a large scale, probably the first of its kind, has been constructed near Stockholm to supply the great local demand. The wood, consisting of logging waste, wood in the smaller pulpwood sizes, and dead wood, is being floated to the mill from Norrland, and 300,000 cu. m. stacked measure have already been transported successfully in this way.

33.06 : 33.38.1 : 92 (485). Kastveden och kolningen. **[Fuelwood and charcoal burning.]** *Skogen* 27, 1940 (375–6). [Sw.]

The demand for producer fuel in Sweden has begun to encroach upon that for domestic firewood, and an official order has been issued, taking effect from 9th September, 1940, under which wood graded as first-class firewood or boiler wood, and cut to lengths of 1 m. or less, may not be used for charcoal burning without a special licence from the Fuel Commission. Licences are to be granted wherever the supply of household firewood is not endangered; in addition, certain portions of the country are exempted from the order.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.12. Joinery

33.12. **General observations on the nailing of wood.** *Tech. Note For. Prod. Lab., Wis.* No. 243, 1940. pp. 2.

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. NEVIN, J. V. **Improvements in or relating to the production of plywood.** *British Patent* No. 524,647. Building Sci. Abs. (*n.s.*) 13 (643). P.R.

To prevent the formation of checks and blisters and to forestall possible future warping, hot-pressed plywood panels are treated with a hot humid atmosphere immediately after pressing and before they have cooled.

33.15. LEWENSTEIN, A. S. **Surfacing laminated sheets, plywood, wallboards, asbestos sheets and the like.** *British Patent* No. 523,277, 10th July, 1940. pp. 3. P.R.

Sheet material is provided with a hard and resistant, dull or rough surface by applying under heat and pressure a surface sheet of paper, fabric, or wood, impregnated with a thermo-hardening synthetic resin, and pressing between sheets of fabric, hard composition board or the like, instead of the usual highly polished metal plates. Synthetic-resin laminated sheets may also be surfaced by interleaving with such materials during the pressing process.

33.15 : 33.8. **How to make a laminated diving board.** *Tech. Note For. Prod. Lab., Wis.* No. 244, 1940. pp. 4.

33.17. Sawmilling

33.17 (71.4) : 09.4. Scieries du Québec. **[Sawmills of Quebec.]** Office des Produits Forestiers, Ministère des Terres et Forêts, Québec. 1939. pp. 92. [F.]

33.17 : 31.28. HARRIS, P. **The machining of abrasive timber.** *Repr.* from *Engineering* Dec. 27, 1940, pp. 4. [Forest Products Research Laboratory, Princes Risborough, Bucks.]

In order to obtain the best output from a cutter the feed speeds should be as fast as the material and machine permit. This will provide longer service from tools, increase production and reduce energy consumption.

33.17 : 53.43.2 : 76. TELFORD, C. J. **Short-cut method of finding the minimum sized tree that pays its way through small sawmill operations.** Forest Products Laboratory, Madison, Wis. No. *R*899–13, 1940. pp. 6. P.R.

33.17 : 84. TELFORD, C. J. **Small sawmill accounting.** Forest Products Laboratory, Madison, Wis. No. *R*899–12, 1940. pp. 8. P.R.

33.3. *Chemical Treatment*

33.32. Pulp and Paper Manufacture

33.32 (76 : 75) : 09.4. MOON, D. G. **The pulp and paper industry—its meaning to the South.** *Sth. Pulp Paper J.*, 2nd annual review no., 1940 (20–2).

33.32 : 31.3. PATRICK, J. G. **Chemistry in pulp and paper making.** *Sth. Pulp Paper J.*, 2nd annual review no., 1940 (32–50, 52).

A popular review of the process of papermaking, dealing chiefly with the chemical aspects.

33.32 : 31.3. LAROCQUE, G. L., and MAASS, O. **The mechanism of the alkaline delignification of wood.** *Canad. J. Res.* 19, Sec. B, 1941 (1–16). [Division of Physical Chemistry, McGill University, Montreal.] P.R.

Measurement was made of the rate of delignification of Spruce wood with lithium, barium, sodium, potassium, and tetra-ethyl ammonium hydroxides under closely controlled conditions of temperature and concentration. The reaction rates were compared with the ionic mobilities and adsorption coefficients of the different alkalis. Methanol, ethanol, and glycerol were used as solvents. From these results a mechanism is suggested, according to which adsorption of alkali at the reaction interface is the determining factor in setting the rate of delignification. The rate is also dependent on the specific nature of the alkali cation and varies with the temperature in accordance with the general theory of thermal activation. *Authors' summary.*

33.32 : 33.02. RUNKEL, R. Die Rohstoff-Verlagerung der Zellstoff- und Papierindustrie und der Zug nach dem Süden. **[Raw material supplies in the pulp and paper industry and the southward movement.]** *Papierfabrikant* 39, (5/6, 7), 1941 (29–33, 42–4). [G.] P.R.

The forest resources of Africa are considered the most promising source of raw material for the German paper industry. The future German management of the forests of West and Central Africa [*sic*] will involve the felling of large quantities of timber that can only be used as pulpwood or for the manufacture of charcoal

for producer gas. A research programme on the utilization of colonial timbers for paper-making is outlined. Research to date indicates that the utilizability of a tree species is determined by the chemical properties of the wood, rather than by fibre morphology, and that there are distinct possibilities for a mixed utilization of tropical species, some of which are complementary. For instance, studies at the Reichsinstitut für ausländische und koloniale Forstwirtschaft have shown that the woods of Mangrove and of the Umbrella Tree are complementary in that the wood of one species has a tendency to yield a very dense and glossy paper and that of the other a very loose and opaque paper.

33.32 : 33.02 : 12.25. MARTIN, J. S., and BRAY, M. W. **Sulphate pulping of Western White Pine (*Pinus monticola*).** *Paper Tr. J.* 111 (25), 1940 (35–8). [Forest Products Laboratory, Madison, Wis.] P.R.

In general, this species is readily reduced by the sulphate process for the production of strong and bleachable pulps of comparatively high yield and fairly satisfactory physical properties. While some of the strength properties are slightly inferior to the average commercial product, the fibres possess excellent tensile strength and good felting quality. *From authors' summary.*

33.32 : 33.02 : 12.25. BENSON, H. K., and WALTON, A. T. **Pulping of Douglas Fir with nitric acid.** *Paper Tr. J.* 111 (10), 1940 (27–30). [University of Washington, Seattle.] P.R.

Douglas Fir, when cooked for six hours with a 6 per cent. solution of nitric acid followed by a one-hour cook in 1·5 per cent. sodium hydroxide, yielded a pulp of very good quality but low in quantity in comparison with yields from Hemlock and Spruce by the usual methods.

33.32 : 33.02 : 12.26–8. RUNNING, K. D. **Hardwood utilization by the paper industry.** *Pulp Paper Mag. Can.* 42 (2), 1941 (104–6). [Anglo-Canadian Pulp and Paper Mills, Ltd.]

Species that are little used by the paper industry but are abundant in Canada include Jack Pine, which gives pulping difficulties, Birch and Maple, which quickly rot when piled with the bark on and, having a high density, are difficult to transport by river, and Aspen, which is nearly as easy to log as conifers. Information on the use of these species for groundwood, sulphite, soda and semi-chemical pulps is presented from mill reports. Samples of the pulps have been tested under standard conditions at the Pulp and Paper Research Institute of Canada.

33.32 : 33.02 : 12.26–8. CURRAN, C. E. **Hardwoods and the semichemical pulping process, production of semichemical boards from Red Gum and Blackjack Oak.** *Repr.* from *Fibre Containers* Oct., 1940. pp. 3. [Forest Products Laboratory, Madison, Wis.] P.R.

Using the semichemical pulping process the Forest Products Laboratory has made excellent corrugating papers in high yields from Red Gum and Blackjack Oak. Spent Chestnut tannin chips are at present a cheap source of material for such products and place other hardwood pulps at a disadvantage in cost, but owing to the prevalence of Chestnut blight the supply is likely to become exhausted in 12–15 years. The possible use of semichemical hardwood pulps for other paper products is also discussed.

33.32 : 33.02 : 12.26–8. DEN, H. **Pulp manufacture from Manchurian 'Sirakanba' Birch. II, III. Sulphite process using cooking liquors of low, and high, concentrations.** *J. Soc. chem. Ind. Japan* 43, 1940 (174–5B). B.C.P.A. 1940, B (850). P.R.

33.32 : 33.02 : 12.26–8 : 31.3. SHIKATA, M., and KIMURA, Y. **Pulp woods of Manchoukuo. VI. Fibre length, composition and cooking experiments of hard wood [*Ulmus macrocarpa* and *U. laciniata.*]** *J. agric. chem. Soc. Japan* 16, 1940 (631–40). B.C.P.A. 1940, B (849). P.R.

33.32 : 33.02 : 31.1. HUBER, B., and SCHMIDT, E. Über die anatomische Bewertung von Papierhölzern. **[On the anatomical evaluation of paper pulpwoods.]** *Wbl. Papierfabr.* 71 (11), 1940 (125–30). [G.] [Forstbotanisches Institut und Reichsinstitut für ausländische und Koloniale Forstwirtschaft, Tharandt.] P.O.

Using fibre length and other anatomical characters as criteria, 15 Cameroons timbers were selected as *prima facie* likely to be suitable for paper manufacture. Six out of eleven of these timbers passed preliminary paper-making tests. It is thought that anatomical evaluation is useful in the preliminary sorting of tropical timbers according to their pulping qualities.

33.34. Dyeing and Bleaching of Wood

33.34. MOORE, C. G., and ZUCKER, M., Assrs. to GLIDDEN CO. **Wood staining.** *U.S. Patent* No. 2,105,984, 18th Jan. 1938. B.C.P.A. 1940, B (862). P.R.

Specification of a water-soluble stain that does not raise the grain.

33.34. PRESTON, C. F., Assr. to LIGNOSE, INC. **Treatment of wood.** *U.S. Patent* No. 2,111,494, 15th Mar., 1938. B.C.P.A. 1940, B (862) P.R.

Specification of a staining process for emphasizing natural fatty grain.

33.36. Preservation of Wood. Seasoning and Drying

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1 : 31.22.1. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

The moisture content of unvarnished timber samples 1 in. thick, placed outside but protected from precipitation, was found to vary as much as 7·5 per cent. between the wettest and dryest months. This was reduced to 4 per cent. by 3 coats of varnish (p. 26).

33.36.1. HYLER, J. E. **Southern treating plants increase life of Southern Pine and hardwoods.** *Sth. Pwr. & Industr.* 58 (9), 1940 (60–4). R.A.M. 20 (99).

General information on wood-preserving plants, species of wood, preservatives, and methods in use in the southern United States.

33.36.1. TENGER, C. G. **Process of preserving wood.** *Canadian Patent* No. 390,625, 13th Aug., 1940. Chem. Abs. 34 (7084). P.R.

To the end of a freshly cut log is applied a solution containing sugar and an ester or esters of aliphatic sulfodicarboxylic acids at 40° to 120° F. as a wetting or dispersing agent to facilitate penetration of the solution into and through the wood, the solution having osmotic action on the wood, and the solution caused to travel through the log toward the opposite end.

33.36.1 : 12.26–8 : 31.42.12 : 31.43. GOLD COAST. **Report on the Forestry Department for the year 1939-40.** Govt. Printing Dept. (Publications Branch), Accra. 1940. pp. 8.

While santobrite prevented blue stain on *Triplochiton scleroxylon* it did not prevent attack by a bostrychid beetle (p. 4).

33.36.1 : 13.2 : 31.43. WATERSTON, J. M. **Report of the Plant Pathologist, 1939.** Hamilton, Bermuda. 1940. pp. 13. R.A.E. A29 (138).

Application of a proprietary insecticide destroyed *Calotermes* (*Kalotermes*) *brevis* in infested timber and no re-infestation occurred during the following year. Timber pressure-treated with a coal-tar preservative and used in trestle bridges has remained uninfested by *C.* (*K.*) *approximatus* for 10 years. The latter species has severely attacked 12- to 20-year-old poles of *Juniperus bermudiana* and cross-pieces of the same wood and of *Pinus palustris*; 20-year-old poles of *Eperua falcata* were only slightly infested, and cross-pieces of *Nectandra rodioei* were very resistant. Insulator pins made of *Hymenaea courbaril* are susceptible to attack and are being replaced by metal ones.

33.36.1 : 13.2 : 31.43 : 45.3. TURNER, N. **Termites and carpenter ants.** [***Reticulitermes flavipes* KOL. and *Camponotus herculeanus pennsylvanicus* DeG.**] *Tree Pest Leafl., Boston* No. 47, 1940. pp. 3. [Connecticut Agricultural Exp. Sta.]

A brief description of the distribution, characters and control of, and damage by, the eastern subterranean termite (*R. flavipes*) and the carpenter ant (*C. herculeanus pennsylvanicus*).

33.36.1 : 33.15 : 31.43. CUMMINS, J. E. **Recommendation for the commercial treatment of green sapwood veneer using a 1·25 per cent. solution of boric acid.** *Repr. Div. For. Prod. Aust.* No. 73, 1939. pp. 8. [*Extr.* of *Repr.* No. 56 from *J. Coun. sci. industr. Res. Aust.* 12 (1), 1939.]

Details, including the design of a treating tank, are given for use against *Lyctus* attack. The cost of treating 100 sq. ft. of $\frac{3}{16}$-in. veneer is estimated at 1s. 2d. The process is being patented.

33.36.1 : 33.31 : 31.43 : 13.2. **Summary of experiments carried out by the Committee [on the Deterioration of Structures in Sea-water] on the deterioration of structures of timber, metal, and concrete exposed to the action of sea-water.** *J. Inst. civ. Engrs.* 14, 1939–40 (383–91). L.S.

Tests showed that the resistance of timber to attack by *Teredo* larvae was not perceptibly improved by adding chloro-dihydrophenarsazine ('DM') to the creosote used for impregnation, and there was even some indication that very small proportions of this substance (about 0·1 per cent.) might attract marine borers to the timber. The difficulty of securing adequate penetration by creosote was met by incising the timber. With surface areas of up to 3 sq. in. per incision the quantity of creosote absorbed did not vary materially, but with further increases in area the absorption diminished rapidly. Weighing the timber before and after creosoting was found to be unsatisfactory as a means of determining the amount absorbed.

33.36.1 : 33.52 : 31.41. **Report of 31st annual inspection of C., B. & Q.R.R. experimental ties.** *Wood Pres. News* 19, 1941 (1–4). P.R.

Tables are given of service data for treated and untreated cross ties laid by the Chicago, Burlington and Quincy Railroad Co. in 1909–10. Untreated ties have shown the following average lives in years :—Cottonwood 2·9, Sycamore (Plane) 3·3, Tupelo Gum 3·5, Red Birch 3·6, Soft Maple 3·6, Red Gum 4·1, Hard Maple 4·7, Hemlock 4·9, Beech 5·0, Ash 5·1, Tamarack 5·1, Loblolly Pine 5·3, Poplar (Tulip Tree) 5·3, Red Oak 5·3, White Elm 5·3, Hickory 5·5, Pin Oak 6·3, (Southern) Cypress 8·3, Chestnut 9·7, White Oak 11·1. Detailed records for ties of these species are tabulated by species and treatments. Of the treating processes used the full-cell process (10–12 lb. of creosote per cu. ft.) has given the highest average life and the least decay, the Card process ($\frac{1}{2}$ lb. of zinc chloride and 3 lb. of creosote per cu. ft.) being the next best, and the Burnett process ($\frac{1}{2}$ lb. of zinc chloride per cu. ft.) the worst in these respects.

33.36.1 : 33.53 : 33.54. FINLAY, R. H. **Timber preservation. Butt treatment.** *Bull. Dep. Agric. S. Rhod.* No. 1159, 1940. pp. 14.

Poles should be completely barked at time of felling and properly air seasoned for at least one month per inch of diameter. Treatment consists in placing butts in preservative solution for 3 hours or more at a temperature of 180° to 210° F. followed by cooling through 100° for 20 hours. At least 10 lb. or 1 gal. of solution should be absorbed per cu. ft. of wood. Creosote used in this way should keep the wood in sound condition for 20 years or more.

33.36.1 : 33.8 : 31.42.1. SAHLMAN, E. J. Impregnering av färdiga träprodukter mot röte och blånad. **[Impregnation of finished wood products against sap stain and rot.]** *Pappers- och Trävarutidskrift för Finland* 22, 1940 (259–60). [Sw.] L.S.

Tests made at the Finnish Institute for Research in Wood Technology ['Trätekniska Forskningsinstitutet'] are stated to have shown that 5 per cent. petroleum solutions of either penta- or tetrachlorophenol give excellent protection against sap stain and rot. Brush treatments are fully effective if carefully done. Tetrachlorophenol has the advantage over pentachlorophenol of being readily soluble; it could be sold as a concentrated stock solution to be diluted at the time of use, thus saving much in transport costs. Treatment with the oil-soluble chlorophenols does not affect the colour of the wood, leaves practically no smell, and as soon as the solvent has evaporated paint or other finishes can be applied.

33.36.2. *Fireproofing*

33.36.2 LEFEBURE, V., ETRIDGE, J. J., HIMSWORTH, F. R., and IMPERIAL CHEMICAL INDUSTRIES, LTD. **Anhydrite plasters.** *British Patent* No. 524,928. 11th Jan., 1939. B.C.P.A. 1940, B (861) P.R.

For painting on wood to improve fire resistance.

33.36.2 : 33.51 : 31.45. BOWEN, J. W., and LOMBERG, B. R. **Underground fires, their cause, occurrence and prevention.** Transvaal Chamber of Mines Timber Research Laboratory, Johannesburg. 1939. pp. 39.

Numerous tests indicate that it is impossible to ignite sound lagging and mat packs with tshisa sticks, candles and miners' lamps under normal conditions of temperature, humidity and ventilation. Timber treated with preservatives is less inflammable than sound untreated timber, and it is possible to fireproof timber completely against flames underground at a reasonable cost. With decayed timber an underground fire can be started using any form of flame, including cigarette butts, and the risk from carbon monoxide poisoning is much greater from the burning of decayed timber than from that of sound timber. *From authors' summary.*

33.36.3. *Seasoning. Drying*

33.36.3 : 07.7. STEVENS, W. C., and JOHNSTON, D. D. **Timber drying kilns: the overhead internal fan kiln (double stack pattern—improved design).** *Leafl. For. Prod. Res. Lab.* No. 10 (revised ed.), 1941. pp. 12 + illus.

33.36.3 : 12.25 : 31.22.2. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Measurements of specimens of *Pinus patula* showed a range of longitudinal shrinkage between 0·023 and 0·233 per cent. in drying from green to air-dry condition, and it reached a maximum towards the centre of the tree. In drying from air- to oven-dry condition the ratio between longitudinal and transverse shrinkage was found to double (p. 25).

33.36.3 : 31.42.1 : 31.8. BURMA. **Report on forest administration in the Utilization Circle, Burma, for the year ended the 31st March, 1940.** Supt., Govt. Printing and Stationery, Rangoon. 1940. pp. 45.

Air-seasoning tests with the species *Bombax insigne*, *Mangifera indica* and *Tetrameles nudiflora* showed that boards closely piled without stickers were severely stained after seven days and at the end of fourteen days were badly damaged by mould, stain and fungus and had developed an unpleasant odour. There was also considerable staining in the stacks with stickers, and the first-named species showed considerable end-splitting while the other two showed a tendency to warp or twist (p. 10).

33.36.3 : 33.31 : 31.22.2. GRACHEV, I. D., and KOVALENKO, A. G. **Impregnation of wood with sugars as a means of increasing its moisture resistance.** *Lesokhim. Prom.* 1940 (9), (29–33). [R.] L.S.

In experiments at the Central Forest Chemistry Research Institute (TsNILKhI) with specimens of Birch, Spruce, and Pine, a very similar reduction of the swelling coefficient (percentage of swelling per 1 per cent. of moisture absorption) was observed as a result of either a 55 per cent. (by weight) impregnation with saccharose or a 15 per cent. (by weight) impregnation with glucose using potato molasses, followed by drying at temperatures of 110° or 141° C.; the coefficient of swelling after immersion in water for 3 days being reduced through these treatments by about 40 to 50 per cent. For the same sugar content, swelling was slightly less in specimens dried at the higher of the two temperatures.

33.36.3 : 33.51 : 32.25.5. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939-40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

Seasoning experiments indicate that pitprops should be peeled immediately after felling and cross-cutting, and seasoned in the stack for eight to ten weeks (p. 7).

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38.1. LINDMAN, K. Kolning av rå ved. **[Charcoal burning of green wood.]** *Skogen* 27, 1940 (377–8). [Sw.]

Present conditions may necessitate the use of green wood for charcoal burning. In such cases a smoke-stack pile should be preferred to the ordinary kind. Wood for the centre and periphery of the pile should be straight and of small diameter, the remaining billets being stacked between as closely as possible. Lively ignition should be secured when firing the charge and the gases should be allowed to escape comparatively freely at first. Two methods may be used in the initial stages of the burn to prevent steam from condensing in the cooler portions of the charge: (i) the top may be allowed to smoke freely for a day or two; (ii) an uncovered ring may be left round the bottom of the charge for the first few hours. After the initial stages, burning should be slower than with dry wood.

33.38.1 : 07.7 : 33.37. Konstruktioner för mil- och retortugnar. **[Constructional details for charcoal kilns and retorts.]** *Skogen* 27, 1940 (367–8). [Sw.]

The Swedish Fuel Commission has completed specifications for charcoal kilns in 4 different sizes, the capacities varying from 8 to 100 cu. m. Apparatus for the partial recovery of volatile products can be fitted to the 3 larger sizes. Specifications for retorts to give fuller utilization of the by-products are being prepared. All specifications are to be made available to the public at cost price.

33.38.2 (94) : 33.38.1 GREGSON, F. **Mobile producer gas units and charcoal fuel.**

Some problems of development in Australia. *Aust. For.* 5, 1940 (88–102).

A survey of the position and prospects of the use of charcoal gas in Australia. Consumption of petrol and oil fuel in Australia is approximately 350 million gallons per annum, and a 10 per cent. reduction in this figure would require the conversion of no less than 44,000 of the vehicles consuming 800 gallons or more per annum. At £50 per vehicle on mass production lines, the total expenditure to convert this number of vehicles would be £2,200,000. In addition, an organization would have to be developed for production and distribution of 250,000 tons of charcoal per annum, involving a further capital expenditure of some £400,000. It is thought that the sums involved justify the attention of private enterprise to the manufacture of producer units and charcoal production and the attention of State and Commonwealth Governments to encouraging development on sound lines. Since it is certain that the rate of expansion of producer gas will fall considerably with the cessation of hostilities, it is suggested that a statement should be made by the Commonwealth Government that irrespective of the continuation of the war it would be prepared to encourage the use of producer gas up to some given proportion of total fuel consumption; this would give the necessary assurance of continuity of demand to private enterprise, thus greatly stimulating the use of producer gas.

From the data available it appears that on 1st September, 1940, a total of 4,000 to 4,500 mobile units, including farm tractors, were in operation in Australia, compared with 800 to 1,000 one year previously. Practically all these were charcoal-burning producers. Sale of producers in Australia is now regulated by a licensing system under Commonwealth and special State regulations. Following a representative conference in Melbourne in December, 1939, technical committees have been set up by the Commonwealth and each State Government to consider producer-gas matters, a standard test procedure has been adopted, and one testing authority has been recognized by the Commonwealth Government in each State. Furthermore, a number of units have been fitted to Government vehicles in each State to obtain experience with this form of fuel.

It is thought that the ultimate future of producer gas in Australia will mainly depend on the solution of the problem of supplying properly graded fuel in vast quantities and at a reasonable cost. The recent sudden increase in number of producer units operating has resulted in a temporary shortage of charcoal supplies and a rise in prices. There is no lack of suitable fuelwood for charcoal burning, but there is still a general lack of knowledge as to what the requirements of a good gas charcoal should be and how to supply a uniform product without undue expenditure. The Forest Department at Dwellingup is investigating these problems, using Jarrah fuelwood. The eventual organization of charcoal production on a large scale should be combined with a system of licensing.

33.38.2 : 07.7. GROBÉTY, W. **Wood-gas generators.** *British Patent* No. 512,550, 19th Sept., 1939. Chem. Abs. 35 (603). P.R.

These comprise a substantially funnel-shaped container, the narrow part of which serves as a gasifying zone which is connected to a conduit for the discharge of the gases produced, means being provided for supplying air to the said container, which is disposed in the interior of an extended reservoir intended to receive the wood to be gasified, the reservoir being concentrically arranged in the interior of an outer cylindrical casing.

33.38.2 : 33.06 : 12.26–8 (94). ALMOND, J. N., HOLMES, B. M., and PLANTE, E. C. **An examination of some Australian hardwood charcoals with special reference to their suitability for charcoal gas producers.** *Pamphl. Coun. sci. industr. Res. Aust.* No. 103, 1940. pp. 28.

Almost without exception, the commoner Australian hardwood charcoals tested were found to comply with the provisional specification for wood charcoal which had been prepared in December 1939 as a guide to purchasers of charcoal for mobile producers. The samples tested were drawn from ordinary commercial charcoals burnt by a variety of methods. As a result of the tests, suggestions are made for the improvement of several clauses of the provisional specification, which is reproduced in the Appendix.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. CAMPBELL, W. G. **The production of sugar, alcohol, and other products from**

wood. *Chem. Ind., Lond.* 40, 1941 (47). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

From the available economic data, mainly German, it appears that despite the fact that sugar, alcohol, and a range of other useful products can be obtained from wood by acid hydrolysis, no known process is likely to be economically applicable in Great Britain in the present emergency.

33.4. *Converted Structural Timber*

33.4 : 31.0 (94). **Flooring. Australian flooring timbers.** *Mon. News Lett. Div. For. Prod. Aust.* No. 110, 1941 (3–5).

Includes a list of Australian flooring timbers indicating the type of floor for which each is suited.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

33.52 (728.2) : 33.36.1. NELSON SMITH, J. H. **Use of British Honduras woods for railway sleepers or cross ties.** *Carib. For.* 2, 1940–41 (75–9). [E.e.span.]

The chief species used were *Calophyllum brasiliense* var. *rekoi* and *Pinus caribaea*, while *Symphonia globulifera, Terminalia amazonia* and other hardwoods have been used to a limited extent. Untreated, hewn hardwood sleepers are badly damaged by fungi and termites and require replacement after 3–4 years. Results from 'brush treatment' of such sleepers with creosote are inconclusive but it is believed to increase their life by 12–18 months. Seasoning for 4 to 6 months in well-arranged piles on elevated racks under cover is thought to give similar results.

Untreated, hewn sleepers of Pine seasoned for 4–6 months have a life of 2–3 years, while sawn and seasoned Pine sleepers cut from knotty tops containing boxed heart and sapwood on three or four sides and treated by open-tank process with a mixture of 45 per cent. petroleum fuel oil and 55 per cent. coal-tar creosote were found to be free of any defect after four years. *From author's summary.*

33.6. *Packing Boxes, Crates, etc.*

33.6 : 12.26–8 : 31.0. BURMA. **Report on forest administration in the Utilization Circle, Burma, for the year ended the 31st March, 1940.** Supt., Govt. Printing and Stationery, Rangoon. 1940. pp. 45.

The timber of *Swintonia floribunda* is well suited for box shooks (p. 16).

33.7. *Firewood*

33.7 : 07.7. BRATTON, A. W. **The testing of Char-Wood Heaters in Connecticut. Progress report.** *Occ. Pap. Ntheast. For. Exp. Sta.* No. 10, 1940. pp. 10.

The heater is made of cast iron, is 33½ in. high by 18¾ in. by 25 in., and weighs 350 lb. It appears to give a more uniform heat than is usual with this type of stove and requires about 4 cords of wood to heat 2 rooms of 2,275 cu. ft. content for a 6-month winter period. Certain difficulties in operation and weaknesses in design are being investigated and improved on where possible.

33.8. *Other Manufactured Products*

33.8 : 31.0. AINSLIE, J. R. **Timbers used in the construction of aeroplanes.** *Wood* 6, 1941 (60–3).

The species most commonly used in aircraft construction are Ash and Sitka Spruce. The material characteristics required for each part of the plane are discussed, giving the timbers now in use and suggesting others that should be suitable.

33.9. *Grading and Storage of Converted Timber*

33.91 : 12.25 : 98.3 (71.4). Règles de classement, épinette et sapin. [**Grading rules for Spruce and Fir.**] Office des Produits Forestiers, Ministère des Terres et Forêts, Québec. 1939. pp. 9. [F.E.]

33.91 : 12.25 : 33.8. **Material specification: Sitka Spruce as rough timber.** *Air Ministry Specification* No. D.T.D. 28B, 1940. pp. 2. H.M. Stationery Office, London.

33.91 : 98.3 (71.4). Règles de classement, Pin Blanc, Pin Rouge, bardeaux de Cèdre, lattes, bois de chauffage. [**Grading rules for White Pine, Red Pine, Cedar shingles, laths, and fuelwood.**] Office des Produits Forestiers, Ministère des Terres et Forêts, Québec. 1939. pp. 13. [F.E.]

33.91 : 12.26–8 (410). **Home-grown hardwoods for national stock.** *J. Land Agents' Soc.* 40, 1941 (70–4).

Grading requirements for converted timber of the various species.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.24. Tanning Material

34.24. LLOYD, D. J. **Vegetable tanning materials of the British Empire.** *Leather World* 32, 1940 (750–1). B.C.P.A. 1940, B(883). P.R.

A review of the properties and sources of Mimosa, Myrobalans, Gambier, Mangrove, Mallet, Sumach, Tara pods, Sant grains, Hemlock bark, Avaram bark, and Divi-divi.

34.24 : 12.26–8. OSIMA, Y., SIRAKI, Z., and HYO, Z. **Vegetable tannins in Taiwan. VI. Manufacture of tanning extract from bark of *Acacia confusa*.** *J. agric. chem. Soc. Japan* 16, 1940 (626–30). B.C.P.A. 1940, B (883). P.R.

34.24 : 12.26–8 : 98. La conflagración europea, ha creado una difícil situación a la industria tanífera y a los obrajes. **[The European conflagration has created a difficult situation for the tannin industry and the timber industry [connected with it].]** *Maderil* 12 (143), 1940 (1–3). [Span.]

As a result of the European war Argentinian exports of quebracho extract and logs have decreased by approximately 50 per cent.

34.25. Medicinal and Edible Plants

34.25 (67 : 68). GREENWAY, P. J. **East African plants of proved or potential value as drug producers.** *E. Afr. agric. J.* 6, 1940–41 (127–34). [East African Agricultural Research Sta., Amani, Tanganyika Territory.]

34.25 : 12.26–8 : 23.52 : 31.2 : 33.06 : 57. SCHWEIZER, J. Over lamtorosoorten als houtleveranciers in een koffieaanplant. **[Species of *Leucaena* as wood producers in a coffee plantation.]** *Bergcultures* 14, 1940 (1069–77). [Du.] H.S.B.

The rôle of shade trees in coffee plantations is twofold: to form a canopy that is easily manipulated in the interest of the main crop, and to supply fuelwood for drying the crop when harvested. The present paper compares the wood yield, wood properties, and shading effects of *Leucaena glauca*, which is the shade tree commonly used for coffee in the Dutch East Indies, with those of *L. pulverulenta* and *L. glabrata* × *L. glauca* (both budded on *L. glauca* stocks). Four-year-old buddings of *L. pulverulenta* and *L. glabrata* × *L. glauca* gave yields of stem wood above the budding point of 51·5 and 34·8 kg. dry weight, respectively, whereas *L. glauca* controls gave only 9 kg. *L. pulverulenta* gives the highest yield and the densest shade, and its wood has the lowest specific gravity, the highest moisture content, and is the least tough, *L. glabrata* × *glauca* is intermediate, and *L. glauca* shows the converse for all these properties. The stocks of *L. glauca* on which the other two kinds are budded largely assume the characters of the scions as regards rate of growth and specific gravity and moisture content of the wood. *L. glabrata* × *glauca* would appear to offer the most promise as a coffee shade tree since (i) it yields ample fuelwood, (ii) its shade appears the most favourable, (iii) it sprouts rapidly after lopping and quickly restores protection to the plantation, and (iv) its wood is harder and tougher than that of *L. pulverulenta*.

34.25 : 12.26–8 : 12.11.11. HENNIG, K., and OHSKE, P. Der Vitamin C-Gehalt der Früchte und Blätter von *Juglans regia* und *Juglans nigra*. **[The vitamin C content of fruits and leaves of *Juglans regia* and *J. nigra*.]** *Biochem. Z.* 306 (1), 1940 (16–23). [G.g.] [Institut für Biochemie und Weinchemie, Versuchs-und Forschungsanstalt für Wein- und Gartenbau, Geisenheim am Rheine.] L.S.

Both species of Walnut were found to be very rich in vitamin C. The green hulls of *J. regia* contained as much as 950–1,000 mg., and the leaves 250–370 mg. of vitamin C per 100 g. of material. For *J. nigra* the figures reached 1,050–1,250 mg. per 100 g. for the green hulls and 350–390 mg. per 100 g. for the leaves.

34.26. Resin. Turpentine. Oils. Sugar

34.26 : 12.11.11 : 31.3. HAWORTH, R. D. **Constituents of natural phenolic resins.** *Nature, Lond.* 147, 1941 (255–7). [University of Sheffield.]

34.26 : 12.25. PETROV, M. **The production of essential oil from thin branches of *Abies nordmanniana*.** *Lesokhim. Prom.* 1940 (1), (47–9.] [R.] L.S.

From investigations to date in the Caucasus and elsewhere such production appears to be economically feasible. The yield of essential oil amounts to 0·21–0·34 per cent. of the fresh weight of the branchwood. The bornyl acetate content of the oil varies from 8 to 32 per cent.

34.26 : 12.25. YAKIMOV, P. A., FEDOROV, A. A., and MOVCHAN, S. D. **Soviet immersion oil [for apochromatic microscopes].** *Sovetsk. Bot.* 1940 (4), (3–17). [R.] A.P.B.

From investigations by the Botanical Institute of the Academy of Sciences of the U.S.S.R. it appears that substances equivalent to the volatile and the non-volatile fractions of Zeiss's Cedar wood oil can be obtained from the essential oil of *Juniperus seravschanica* Kom. and the balsam of *Abies sibirica* Ldb., respectively. Both these species are available in large quantities in the U.S.S.R. and therefore conditions for the manufacture of Soviet immersion oil are thought to be favourable.

34.26 : 12.25. PETROV, M. **The position of and prospects for the production of Fir resin.** *Lesokhim. Prom.* 1940 (7), (56–60). [R.] L.S.

The available laboratory and industrial data point to *A. sibirica* and *A. nephrolepis* as the two Russian Fir species that are most suitable for resin production. Their balsam is used instead of Canada balsam in the Russian optical industry, and there appears to be no reason why it should not be exported. The few plantations of *A. balsamea* that exist in Russia show satisfactory growth and their balsam is of much the same quality as that obtained in Canada.

34.26 : 12.25 : 12.14.8. VSHIVTSEV, N. N. **The bark of *Abies sibirica* as a raw material for the production of essential oil.** *Lesokhim. Prom.* 1940 (3), (54–64). [R.] L.S.

The oil yield averages 2 per cent. of the weight, at 40 per cent. moisture content, of the bark of freshly felled timber, and 1·6 per cent. of that of floated timber. The bornyl acetate content of the oil, including the bornyl acetate equivalent of free borneol, amounts to 20 to 25 per cent. Calculations of utilization costs, based on Russian experience, indicate that the production of essential oil from the bark of *A. sibirica* is financially attractive.

34.26 : 12.25. VSHIVTSEV, N. N. **The tapping of Larch for resin.** *Lesokhim. Prom.* 1940 (6), (33–41). [R.] L.S.

Report on an experiment in Western Siberia in which over 18,000 *L. sibirica* trees were tapped chiefly by the Styrian method, whereby tubes are fitted into bore holes and the resin collected in bottles or covered pots. The resin secured compared in yield and quality with that obtained in Central Europe from European Larch and used there for the production of Venetian turpentine. The cost of producing *L. sibirica* resin was about four times higher than that of Pine resin. The profitable tapping of *L. sibirica* will therefore depend on the availability of special uses for its resin.

34.26 : 12.25. GAVRIS, Yu. A., and KEKUKH, A. M. **The tapping of Pine using closed blazes.** *Lesokhim. Prom.* 1940 (4), (37–42) [R.] L.S.

This method consists essentially in introducing tubes into the sapwood of the tree and collecting the resin in bottles attached to the free ends of the tubes. Thus the resin does not get soiled or mixed with rain water and, it is also claimed, there is no loss of volatile matter. In the tests described, resin of a very high quality was obtained, but it was found that the boring of the holes into which the tubes were introduced was so slow as to make the method uneconomical. It is thought that this deficiency could be remedied by constructing a special motor-driven borer.

34.26 : 12.25 : 12.11.15. SHATERNIKOVA, A. N. **On the replenishment of resin ducts after tapping.** *Lesokhim. Prom.* 1940 (4), (29–36). [R.] L.S.

The investigations described were carried out in the Leningrad region in 80- to 100-year-old Pine stands of different quality classes. In trees that had not been tapped, about 96 per cent. of the ducts were completely filled with resin. The greater the number of tapping seasons a tree had undergone, the higher, usually, was its percentage of empty and incompletely filled ducts, and the longer the time it took these ducts to become replenished after the end of a tapping season. It is thought, therefore, that the percentage of empty and incompletely filled ducts may serve as a useful indication in estimating the degree of exhaustion of a tree and the period of rest it requires.

34.26 : 12.25 : 34.25. PETROV, M. **The prospects of chemical utilization of *Pinus***

***koraiensis* and *P. cembra* forests.** *Lesokhim. Prom.* 1940 (2), (51–3). [R.] L.S.

From the available Russian literature on this subject it appears that possible lines of utilization may include tapping for resin and the extraction of oil from seed and of vitamin C and essential oil from needles.

34.26 : 12.25 : 34.6. VASECHKIN, V. S. **Investigations on resinous stumps in some districts of the Ural.** *Lesokhim. Prom.* 1940 (5; 6), (30–40; 48–54). [R.] L.S.

Investigations on Pine stumps of different age groups, ranging from stumps of recently felled trees to those of trees felled 30 or more years ago, showed that even within the same age group and district the content of resinous substances varied considerably. Nevertheless, it was possible to confirm the belief that in general this content increases with the age of a stump. During the first 5 years after felling this increase was rapid and could be ascribed to the formation of new resinous matter. Thereafter it was primarily conditioned by rot, to which the least resinous stumps and parts of stumps (chiefly sapwood) were the first to succumb. Their elimination was hastened where a forest fire occurred. With increasing age of the stump a number of changes could also be observed in the composition of the resinous matter. In particular there was an increase of substances insoluble in alcoholic ether, and a decrease of fatty acids and their ethers.

34.26 : 12.25 : 34.6. SMIRNOV, D. N., and MEDNIKOV, F. A. **On the complex utilization of wood of low resin content. II. The resin content of 'young' Pine stumps [i.e. stumps of recently felled trees.].** *Lesokhim. Prom.* 1940 (9), (66–70). [R.] L.S.

In the first five years after felling the resin content of the heartwood of the stump increases while that of the sapwood diminishes, the resin content of the stump as a whole remaining more or less constant. Under mass-production conditions in the Leningrad region, the stumps utilized contain on an average 6 per cent. of resinous substances (in terms of the oven-dry weight of the stump).

34.26 : 12.25 : 12.11.11. FERNANDES COSTA, A. Subsidios para o estudo das plantas aromáticas Portuguesas. III. Essência do *Pinus pinea* L. **[Studies on Portuguese aromatic plants. III. The essential oil of *Pinus pinea* L.]** *Noticias Farmaceut., Coimbra* 6, 1939 (39–49). [Port.] Biol. Abs. 15 (6297).

34.26 : 12.26–8. FULLING, E. H. **Syrup and sugar from Maples.** *J. N.Y. bot. Gard.* 41, 1940 (232–43).

A popular account of the Maple syrup and sugar industry in North America.

34.26 : 12.26–8 : 21.62 : 24.2. STEVENSON, D. D., and BARTOO, R. A. **Comparison of the sugar per cent. of sap in Maple trees growing in open and dense groves.** *Res. Pap. Pa. St. For. Sch.* No. 1, 1940. pp. 3.

Open-grown Maple (*Acer saccharum*), and particularly roadside-grown trees with spreading crowns, yielded sap of higher sugar content than the forest-grown trees.

34.26 : 12.26–8. TARAN, E. N. **On the differences in the oil of monoecious and female trees of *Aleurites cordata* R. Br.** *Dokl. vsesoyuz. Akad. s-kh. Nauk* 1940 (19), (13–16). [R.] A.P.B.

In periodicity of formation and properties the oil of monoecious trees differed from that of female trees in that its formation began and ended earlier in the vegetation period; its iodine index and refraction coefficient were higher; its gelatinization took place after a much shorter heating at 282° C. The properties of the oil of monoecious *A. cordata* somewhat resembled those of *A. fordii* Hemsl.

34.26 : 12.26–8 : 12.14.8. SHARKOV, V. I., and KALNINA, V. N. **Oil from the bark of Aspen.** *Lesokhim. Prom.* 1940 (7), (3–5). [R.] L.S.

Properties and yield. Under laboratory conditions the latter amounted to about 10 per cent. of the oven-dry weight of the bark.

34.6. *Utilization of Logging and Milling Waste*

34.6. BALE, A. P. **Using wood waste.** *Wood* 6, 1941 (37–9).

Short notes on the efficient use of wood waste for fuel and destructive distillation, and on the manufacture of wood flour and wood wool.

34.6 : 07.7. BOWLING, R. T. **The mechanical development of a wood-briquetting machine.** *Mech. Engng. N.Y.* 63, 1941 (105–8, 124). [Wood Briquettes, Inc., Lewiston, Idaho.] L.S.

An illustrated description is given of the special pressing machine designed for the production of 'Pres-to-Logs' [*For. Abs.* 1 (227), 2 (155)], with special reference to the mechanical problems of increasing pressure continuously along the feed and standardizing the density of the briquettes.

34.6 : 33.32. CALNAN, E. J., and FRANKLIN, J. N. **Bark and refuse fuel burning.** *Pulp Paper Mag. Can.* 42 (2), 1941 (111–6). [Quebec North Shore Paper Co.]

For maximum efficiency, refuse fuel should be burned continuously six days a week, keeping furnace temperatures at a high level. For optimum results, efforts should be made to mix all refuse fuel, such as chips, bark, mill refuse, etc., to form a homogeneous mass. With a fuel consumption of 2·1 tons per hour or 50 tons per day, it appears possible, even at present efficiencies, to generate 18,700 lb. steam per hour. It is assumed that, with increased efficiency and experience of personnel, etc. a steam production of 20,000 to 25,000 lb. per hour should be obtained. *From authors' summary.*

34.6 : 33.36.3. **Timber seasoning by means of heat from factory waste.** *Industrial Heating Engineer, London* 3 (9), 1940–41 (3–6). L.S.

An illustrated account is given of a factory plant in which wood waste collected from the workshops is used to fire a boiler that heats a number of seasoning kilns.

34.6 : 33.39. COGHILL, R. **Motor fuel: an abundance exists in waste.** *Aust. Timb. J.* 6, 1940 (641).

It has been known for some time that acetone is superior to petrol as a motor fuel, but the cost of acetone has been too high to allow of its use for this purpose. Meanwhile, blended fuels composed of acetone, ethyl alcohol, ether, and acetylene have been evolved. In his investigations at Invercargill, N.Z., the author found that acetone could be prepared from sawdust at a cost that made the eventual alcohol fuel cheaper than petrol. The experience gained at the wood-waste utilization factory that was erected at Southland, N.Z., as a result of this research, suggests that, owing to the bulkiness of sawdust and wood waste, a distinct advantage could be gained by utilizing these waste materials in two stages: conversion at the mills to crude wood molasses and crude acetone, and the refining of the crude acetone and the fermentation and distillation of the crude molasses for the production of ethyl alcohol at a large central refinery. The sawmills of New Zealand and Australia produce, respectively, some 500,000 and 2,000,000 tons of sawdust and wood waste per annum. It is suggested that each ton of this waste could be made to yield up to 20 gallons of motor fuel.

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.2. **Pictured good and poor practice in frame house construction details.** *Tech. Note For. Prod. Lab., Wis.* No. 242, 1940. pp. 8.

38.2 : 31.0 **Suitability of woods for use in barns and other farm structures.** *Tech. Note For. Prod. Lab., Wis.* No. 246, 1940. pp. 8.

38.2 : 31.0. **Suitability of woods for use in the frame house.** *Tech. Note For. Prod. Lab., Wis.* No. 245, 1940. pp. 7.

Usual requirements of building items for both types of structure are listed together with the woods that combine these requirements in high, good and fair degree. The grades of lumbers used for each item are also given.

38.2 : 31.27. SUNG, R. H. L. **Design tables. Their use for timber structures.** *Civ. Eng. P.W. Rev.* 35 (408), 1940 (169–73). Building Sci. Abs. (*n.s.*) 13 (462). P.R.

38.2 : 31.27. WHITTEMORE, H. L., and STANG, A. H. **Structural properties of wood-frame wall, partition, floor and roof constructions with 'Red Stripe' Lath sponsored by the Weston Paper and Manufacturing Co.** *Rep. U.S. Bur. Stand.* No. *BMS* 36, 1940. pp. 26. Building Sci. Abs. (*n.s.*) 13 (473). P.R.

38.2 : 31.27. WHITTEMORE, H. L., and STANG, A. H. **Structural properties of a wood-frame wall construction sponsored by the Douglas Fir Plywood Association.** *Rep. U.S. Bur. Stand.* No. *BMS* 30, 1939. pp. 14. Building Sci. Abs. (*n.s.*) 13 (484). P.R.

38.2 : 31.4 : 33.4 : 33.15. **Durability of laminated wooden barn rafters.** Forest Products Laboratory, Madison, Wis. No. *R*1232, 1940. pp. 2. P.R.

38.2 : 82. ENANDER, M. Bra bostäder för skogsarbetare. **[Good living quarters for**

forest workers.] *Skogen* 27, 1940 (361–3). [Sw.]

Specifications and plans are given for (i) a permanent double wooden cabin comprising two kitchen-living rooms, each with wardrobe, larder, drying cupboard, tool cupboard, and cellar, and (ii) a simple wooden cabin for 2–4 men, transportable by means of a truck. The costs are about 6,000 Kr. and 900 Kr., respectively.

38.3. **Unique logging bridge.** *W. Cst. Lumberm.* 68 (2), 1941 (14–5).

Illustrations and plan of 96-ft. span built in the Olympic peninsula in Washington.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.2. *Temperature Influences*

42.22 : 12.25 : 47 : 21.64. SECREST, H. C., MACALONEY, H. J., and LORENZ, R. C. **Causes of the decadence of Hemlock at the Menominee Indian Reservation, Wisconsin.** *J. For.* 39, 1941 (3–12). [Bureau of Plant Industry, U.S.D.A.]

It is concluded that a severe and prolonged drought period during 1930–37 was the primary cause of decadence and death of the Hemlock (*Tsuga canadensis*), and that the first adverse effect of the drought was the death of the root tips. Attack by the Hemlock borer (*Melanophila fulvoguttata*) appears to be successful only on trees that are already in a dying condition. *Armillaria mellea* was found on the trees that had been successfully attacked by the borer and this fungus is considered as a secondary factor in the death of Eastern Hemlock under forest conditions.

42.22 : 12.25 : 21.2. ALBERTSON, F. W. **Studies of native Red Cedars in west central Kansas.** *Trans. Kans. Acad. Sci.* 43, 1940 (85–95). N.H.M.

Severe drought, which began in 1933, caused heavy mortality to the native Red Cedar (*Juniperus virginiana*), which is nowhere common in the Great Plains Region, and, in the area studied, was found to be restricted to north-facing slopes of exposed limestone or protected river banks.

42.22 : 12.25 : 23.24.4 : 21.62 : 12.11.3. SCHMIDT, W. Knospen- und Triebschädigungen in Kiefernkulturen und ihr Einfluss auf die Wertholzerzeugung. [**Bud and shoot damage in Pine plantations and its influence on the production of quality timber.**] *Forstarchiv* 16, 1940 (67–71, 121–30). [G.] R.M.I.

If planted too late, Pine suffers from the dry period in May, and though the plants may survive, death of the terminal bud or of the leader causes damage to the wood. Other factors, some possibly genetical, may contribute to the damage, but much improvement can be made by maintaining the best possible conditions of cultivation.

An investigation of the occurrence of lammas shoots showed that their formation was particularly favoured by the warm March of 1938. Such shoots developed mainly on lateral branches and seldom on the leader. Races from the highlands of the Black Forest and the Alps had the least tendency to form lammas shoots when planted in the warmest Pine region, whereas those from East Prussia developed as many lammas shoots as races from Mark Brandenburg and south-western Germany. None of the races showed much tendency to produce such shoots when planted in the cool climate of East Prussia. The formation of lammas shoots was followed in the next year by forking and especially marked lateral branching, but this occurred to a much less extent in Pines from East Prussia. Notes are included on unfinished experiments on the artificial removal of the leader, and on the possibilities of improvement by individual selection.

42.3. *Precipitations*

42.32. **The ice-storm of January 1940 and its effect on vegetation in Gloucestershire.** *Proceedings of the Cotteswold Naturalists' Field Club* 1939 27, 1940 (16–20). L.S.

A general account is given of the glazed frost of 27th–29th January, 1940, in Gloucestershire. Damage to individual tree species was in direct proportion to the inability of the branches to bend. Ash suffered the worst damage and Oak the next worst. Serious damage is also reported for Elms, Poplar, Alder, Willow,

Birch, Beech, and Larch. Less damage was sustained by Horse Chestnut and fully grown conifers other than Larch.

42.32. BUFFAULT, P. Les dégats des gelées de décembre 1938 en Saintonge, Aunis, et Vendée. **[Damage by ice storms of December, 1938, in Saintonge, Aunis, and Vendée.]** *Rev. Eaux For.* 78, 1940 (18–22). [F.] Biol. Abs. 15 (6120).

42.5. *Chemical Influences. Nutrient Deficiencies*

42.5 : 42.3. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939–40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

European Larch, Sycamore, Ash, Beech and Oak are all susceptible to leaf scorch if sprayed with sea-water (p. 11).

42.5 : 21.32 : 21.2. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939–40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

It appears possible that chlorosis in Douglas Fir in Cornwall is due to potassium deficiency. Chlorosis of Beech growing on chalky soils of the Chiltern Hills is due to iron deficiency, while that in young Beech plantations on the South Downs appears to be due to exposure and conditions related to seasonal water deficiency (pp. 10–1).

42.5 : 12.25 : 21.32 : 23.26. SIMMONDS, J. H. **Report of the Plant Pathological Section.** *Rep. Dep. Agric. Qd.* 1939–40, 1940 (10–11). R.A.M.20 (151).

Chlorosis in Hoop Pine (*Araucaria cunninghamii*) nurseries in Queensland was shown by means of leaf injections to be due in most cases to an iron deficiency closely linked with high salt concentrations in the water used for irrigation.

42.5 : 12.25 : 21.32. NĚMEC, A. Untersuchungen über die Ursachen des Absterbens eines Fichtenbestandes. **[Research on the causes of the death of a Spruce stand.]** *Forstwiss. Cbl.* 62, 1940 (105–13). [G.] R.M.I.

Experiments showed that the death of Spruce in a stand in the Böhmer Wald was due to lime deficiency, though the deficiency was not large enough to affect Pine and Silver Fir.

42.5 : 12.26–8 : 21.32. PIRONE, P. P. **Treating chlorotic Pin Oaks by trunk injections and soil treatments.** *Abstract* in *Phytopathology* 31, 1941 (18).

In chlorotic Pin Oaks (*Quercus palustris*) normal green foliage was restored and twig growth increased within a few months following the insertion of collodion capsules of ferric phosphate into holes bored in the trunks. The chemical was used at a rate of 5 g. per in. of trunk diameter, and the holes ($\frac{1}{2}$ in. diameter) varied from 1–4 according to the diameter of the tree. The capsules were inserted in April, when the trees were still dormant, and the holes plugged with grafting wax. Trees thus treated had mostly recovered after three months, whereas controls were still chlorotic. Soil treatments with a mixture of powdered sulphur, aluminium sulphate, and ferrous sulphate effected some improvement, but less than that obtained from trunk injections.

43. FOREST FIRES

43 : 07.2 (71). **Report on forest fire research in Canada during 1940.** *B.C. Lumberm.* 25 (3), 1941 (25–7).

Developments reported include: (*a*) New fire report forms that give invaluable data for the compilation of hazard index tables to be used as a guide to administrative fire-control action. (*b*) Base maps (1 in. = 2 miles), for use in a master fire-control plan in British Columbia, showing type and condition of roads and trails, to be placed in loose-leaf binders with separate transparent overlays showing fuel type areas, existing and projected look-out coverage, accessibility zones, forest values, risk zones, and 10-year burned areas. (*c*) Design of an improved device for splicing and repairing linen hose. (*d*) Improvements on a portable hose-drying rack. (*e*) A newly designed, lightweight, self-priming, multi-stage, centrifugal, high-pressure pumper recently tested. (*f*) A variable-stream nozzle, the rate of discharge of which may be varied from 0·4 to 1·3 gals. per minute with good length of stream in each case, designed for hand spray pumps. (*g*) Correction of structural weaknesses of small trail tractors and increased general efficiency. (*h*) Improvement of a compact and rigid pedestal-type table for look-out towers so that the table top can be moved in four directions to clear obstructions.

43.0. *Predisposing Factors and Causes*

43.0 (74.2). BROWN, W. E. **Forest fire weather observations 1939–1940.** *Fox Forest Notes* No. 24, 1941. p. 1.

Monthly averages for three daily readings of relative humidity per cent. and fuel moisture per cent., the latter obtained by weighing thin Basswood slats exposed to simulate slash conditions on blowdown areas.

43.0 : 11.32 : 11.33. HAYES, G. L. **Influence of altitude and aspect on daily variations in factors of forest-fire danger.** *Circ. U.S. Dep. Agric.* No. 591, 1941. pp. 38. [Northern Rocky Mt. Forest and Range Exp. Sta.]

Observations were made at eight stations, six of them paired on north and south aspects at 5,500-, 3,800-, and 2,700-foot elevations, and within 50-foot elevation of the top of a ridge rising from west to east. The other two were valley-bottom stations, one fully exposed to sun and wind and the other with a partial timber canopy. The variables observed were wind velocity and fuel-moisture content as affecting fire behaviour, and air temperature, relative humidity, insolation, soil moisture, and precipitation as largely controlling fuel-moisture content. Three altitudinal zones and four time periods having different characteristics on the median August day are recognized. The zones are the high zone, lying above 4,000 feet, the thermal belt from 4,000 to 3,000 feet, and the low zone below 3,000 feet elevation. The periods are the night period from 10 p.m. to 6 a.m., the morning-transition period from 6 to 10 a.m., the day period from 10 a.m. to 6 p.m., and the evening-transition period from 6 to 10 p.m.

During the night period the vertical gradients of most of the factors studied have an inversion centering in the thermal belt. Inversions of relative humidity and fuel-moisture content are brought about by the recurring nocturnal temperature inversions. As a consequence, and despite night-period wind velocities which increase directly with altitude, an inversion of fire behaviour is formed with most dangerous burning conditions in the thermal belt, mid-dangerous in the high zone, and least dangerous in the low zone.

During the day period the various factors affect the altitude and fire-behaviour relationship differently. Temperature and relative humidity tend to effect most dangerous conditions in the low zone, while ½-inch wood remains most inflammable in the thermal belt. Duff on north slopes becomes driest in the high zone, but on south slopes is quite equally dry at all elevations. Likewise, wind on north slopes is strongest in the high zone but on south slopes is nearly equal at all elevations. Resulting fire behaviours on south slopes are slightly more dangerous in the thermal belt than above or below, while on north slopes the greater danger is in the high zone. The morning- and evening-transition periods are, as their names imply, times of changes from night to day relationships and *vice versa*.

Fire behaviour was found, as expected, to be more dangerous during the day than at night and more dangerous on south slopes than on north. Less difference in fire-behaviour rating between day and night conditions and between aspects was found at high elevations than at low, however, indicating that the higher elevation, the more burning conditions at night tend to be like day conditions, and the more north-aspect conditions tend to be like south-aspect.

Of the minor factors affecting fire behaviour, insolation was found to be the dominant control of duff moisture content during midday on south aspects, a major but less dominant control on the fully exposed valley bottom, and of less importance as a control of duff moisture on north aspects and under a partial timber canopy. Soil moisture was found to be affecting duff moisture at all locations at night, but only on north aspects and under a partial timber canopy during the hot part of the day. The difference in amount of rain received at the different stations from the average summer rain did not significantly affect the time during which inflammability was reduced. The exposure of each station to drying influences was the stronger determinant. *Author's summary.*

43.1. *Protective Measures*

43.1. BERNIER, G. H. La protection des forêts. **[Forest protection.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 15. [F.]

43.1 (76.1). ALABAMA. **Annual report, Department of Conservation, State of Alabama, 1st October, 1939–30th September, 1940.** Wetumpka, Ala. 1941. pp. 92.

Under the present policy of co-operative forest fire protection the landowner pays an annual assessment per acre and equal amounts are contributed by the State and Federal Governments. The actual work of fire protection is done by the State (p. 26).

43.1 : 12.19.3. LISTER, P. B. **Fire control on grass ranges of the Pacific Northwest.** *J. For.* 39, 1941 (23–5). [U.S. Department of the Interior, Spokane.]

43.1 : 81. CROCKER, C. S. **Dividends from fire control planning.** *Timberman* 42 (2), 1940–41 (20–6).

Discussion of the fire-control policy and method of fire-danger rating in use in Region 1 of the U.S. Forest Service. Use is made of measurements of fuel moisture, wind, causative agencies, and visibility distance. The relative fire danger determines the man-power made available for fire control.

43.12 : 38.2. Nya typer av skogsbrandtorn. **[New types of forest fire towers.]** *Skogen* 28, 1941 (19–21). [Sw.]

A detailed specification, with photograph, section, and plans, is given for a type of wooden fire tower costing about 2,380 Kr. The tower is built clear of the ground on four corner-stones, and consists of living quarters on the ground floor and a look-out room immediately above. Its chief dimensions are:—height to ridge, exclusive of corner-stones, 9 m.; height to floor of look-out room, 6·4 m.; ground plan 4 × 4 m.; inside area of living room about 3 × 3 m., and of look-out room about 3·6 × 3·6 m. The cost of a similar tower 16 m. high is estimated at about 3,000 Kr. Photographs and a very brief description are also given for a completely different type of wooden tower, consisting of a two-storeyed hut perched on a trestle-like scaffolding and approached by a boxed-in spiral stair. The floor of the look-out room is 15 m. above ground level and about 3 m. square.

43.12 : 38.2. WATSON, J. E. **Selection of fire tower lookout sites in Western Australia by tree climbing and observations.** *Aust. For.* 5, 1940 (116–8).

The tree-climbing method of site selection proved entirely satisfactory in the more southern regions of the Jarrah and Karri forests where there are no prominent features in the topography. Observations and data from the most desirable height were obtained by the use of field glasses and compass. After about 35 climbs had been made, five sites were finally selected and standard towers constructed to a height of 125 ft.

43.13 : 81. LINDH, A. G. **Parachuting fire fighters.** *J. For.* 39, 1941 (160–9).

The organization, training, equipment and costs of an experimental project to test the use of parachute-jumping fire fighters in the Northern Rocky Mountain Region are discussed. It is concluded that skilled and well trained parachutists can be delivered in rough timbered country with wind velocities up to 30 miles per hour and at altitudes up to at least 8,000 ft., and that the project resulted in substantial savings in suppression costs and damages during the first year. Included with the equipment carried by the jumper is a two-way, ultra-high-frequency radio, the complete unit with antenna, microphone, batteries, etc. weighing 6 lb. and measuring 3 by 5 by 11 in. Suggestions are made as to the future development of and improvements in this work.

43.13 : 81. GODWIN, D. P. **The parachute method of fire suppression.** *J. For.* 39, 1941 (169–70).

Discussion of developments in this work during 1940 and of costs of suppression of apparently comparable fires dealt with by parachutists and by ground crews.

43.3. *Fire Damage*

43.3 : 12.25 : 44.3 : 45.3 : 31.8. GARREN, K. H. **Fire wounds on Loblolly Pine and their relation to decay and other cull.** *J. For.* 39, 1941 (16–22). [State Teachers College, Jacksonville, Ala.]

Sixteen per cent. of the Loblolly Pine examined had one or more fire wounds, which were predominantly in the smaller width classes. Fifty-seven per cent. of the wounds recorded were less than 7 in. wide. The size of fire wounds on trees surviving the fire is directly proportional to diameter of tree at time of wounding, and wounds of large widths heal at a proportionately faster rate than small wounds.

Wounds 1 to 3 in. in width result in practically no cull regardless of their age, those 4 to 6 in. in width result in cull of minor importance, while wounds 7 to 12 in. wide will result in considerable cull after 30 years

and those over 12 in. wide after 10 years. For any given wound age, cull volume increases approximately with the square of the wound width. It can be shown that the percentage of the tree rendered useless as a result of wounding increases with increased wound width when this is considered independently of wound age. Wounds above 7 in. in width result in 9 to 12 per cent. loss when the tree is cut for lumber.

Cull following wounding of Loblolly Pine is usually caused by a combination of decay, highly resinous wood, and insect infestation, decay accounting for the greater part of it for all wound sizes. It was found that the rate of increase in cull decreases with increase in density of the wood behind the wound. *From author's summary.*

43.3 : 74.2. BARRETT, L. I., JEMISON, G. M., and KETCH, J. J. **A method for appraising forest fire damage in southern Appalachian Mountain types. A progress report.** *Tech. Note Appal. For. Exp. Sta.* No. 44, 1941. pp. 13.

A key appraisal table shows the average damage in dollars per acre in tangible assets for various classes of forest stand identified on the bases of fire-danger severity, whether of sawlog or less than sawlog size, good, medium or poor stocking, and forest type. The development and application of this table is discussed.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

44.1 : 12.26–8. GRIFFITH, A. L. **The control of *Lantana* by a sodium chlorate spray.** *Indian For.* 67, 1941 (107–14). [Forest Research Institute, Dehra Dun.]

Work so far done indicates that *Lantana* can be successfully controlled by spraying with sodium chlorate at a relatively low cost (Rs.10 per acre), that the spray has no toxic effect on subsequent regeneration, and that the treatment has greatest effect when the first spray is applied at the beginning of the hot, dry season. Complete control has been obtained using a concentration of ¼ lb. of sodium chlorate per gallon of water and applying in three sprays of 24, 8 and 2 gallons per acre respectively. Preparation of solution, method of spraying and effect of spray are discussed.

44.1 : 12.29 : 60 : 97.2 : 43.1 (921). DANHOF, G. N. Tweede bijdrage tot oplossing van het alang-alang vraagstuk in de Lampongsche Districten. **[Second contribution to the solution of the Lalang problem in the Lampong Districts (South Sumatra).]** *Tectona* 34, 1941 (67–85). [Du.e.]

Further suggestions are made regarding the regulation of shifting cultivation by permits and other means, and the protection of lands from fire with a view to checking the spread of Lalang grass (*Imperata cylindrica*) [cf. *For. Abs.* 2 (158)]. Strips of forest 50–100 m. wide should be preserved between the different *ladang* (shifting cultivation) areas, which should be allowed to rest a certain number of years before reverting to cultivation. The regulation of land use should be on a communal or sub-district basis, the cost to be defrayed from the fiscal duty on *ladang* permits.

44.3. *Fungi*

44.3. POMERLEAU, R. Les maladies des arbres. **[Tree diseases.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 8. [F.]

44.3 : 12.21. *Tree Pest Leafl., Boston.* Nos. 41, 44, 45, and 48. 1940.

Each of these leaflets gives a brief outline of the history and distribution, hosts, symptoms, cause, life-history, and control of a forest tree disease. Those dealt with are: (41) the black spot fungus of Elm (*Gnomonia ulmea* (Schw.) Thuem.), (44) the needle cast diease of Pines (*Bifusella, Hypoderma, Hypodermella, Lophodermium*), (45) the sweetfern blister rust of Pitch Pines (*Cronartium comptoniae* Arth.), and (48) the Sycamore and Oak anthracnose (*Gnomonia veneta* (Sacc. & Speg.) Kleb.).

44.3 : 12.25 : 12.21. FREZZI, M. J. La presencia del *Fusarium bulbigenum* v. *blasticola* en la Republica Argentina. **[The presence of *F. bulbigenum* var. *blasticola* in the Argentine Republic.]** *Phys., Buenos Aires* 15, 1939 (87–97). [Span.] Forstl. Rundsch. 12 (132). H.S.B.

The fungus causes damping off of *Pinus*, especially *P. pinea*, and *Cupressus* species.

44.3 : 12.25 : 12.21. PADY, S. M. **Preliminary observations on the aecial hosts of *Melampsorella*.** *Trans. Kans. Acad. Sci.* 43, 1940 (147–53). N.H.M.

M. cerastii is confined in its aecial stage to *Picea* and *Abies*, on which it forms characteristic witches' brooms. A study of this fungus showed a number of differences in the witches' brooms, pycnia, aecia and haustoria on the two host species. These differences are summarized.

44.3 : 12.25 : 12.21. MATTOON, H. G. **Tip blight of Pine and Spruce.** *For. Leaves* 31 (2), 1941 (10).

This disease, caused by *Sphaeropsis ellisii*, does great damage in killing the foliage of shade and ornamental trees, particularly of Austrian and Scotch Pine and Colorado Blue Spruce, and may retard growth of and occasionally kill forest trees. Control measures include the removal and burning of all infected tips just before new growth starts and the spraying of trees with Bordeaux mixture.

44.3 : 12.25 : 12.21 : 31.42.11 : 31.3. BAILEY H. E. **The biology of *Polyporus basilaris*.** *Bull. Torrey bot. Cl.* 68, 1941 (112–20). O.B.D.

A field study of the occurrence of the pocket rot caused by *P. basilaris* in *Cupressus macrocarpa* showed that only 2 per cent. of the trees were infected by the time they were 26 years old, while in another stand 88 per cent. were infected at the average age of 65 years. The rot was found to be limited to the bole; only occasionally was it present in the branches and roots. In the incipient stages of decay only small pockets of rot were found. These grew and finally coalesced to form large masses of decayed wood. Sporophores recurring season after season have been found on both living and dead trunks. Sporulation from these was found to occur for periods up to 45 days. Sporulating fruiting bodies were obtained in culture and spore germination secured. *P. basilaris* was grown in culture on specially prepared blocks of *C. macrocarpa* and the rate of growth was found to be very slow. Analyses of samples from blocks that had lost 10·2, 18·1 and 39 per cent. weight during the process of decay showed a progressive utilization by the fungus of many of the components of the wood. *From author's summary.*

44.3 : 12.25 : 22.88 : 22.89. YORK, H. H. **Fungi observed in the trunks of young Pine trees in natural and artificial established forests.** *Abstract* in *Phytopathology* 31, 1941 (25).

Isolations of fungi and bacteria from the trunks of more than 500 White, Red, Scotch, and Jack Pines in forest plantings, and of more than 100 self-sown trees of White, Red, and Virginia Scrub Pines, the age of the trees varying from 5 to 35 years, showed that: (i) The number and variety of organisms in apparently normal self-sown trees were much less than in apparently healthy planted trees. (ii) The trunks of trees that showed very early symptoms of root and root-crown disturbances had many more and a greater variety of fungi than those showing no visible signs of disease. With the advance of disease in the underground parts there was a marked increase in the number and variety of organisms in the trunk.

44.3 : 12.25 : 23.24.1 : 23.24.2. YORK, H. H. **Relative susceptibility of young Pine trees in artificial and natural stands to various root, root-crown, and butt fungus parasites.** *Abstract* in *Phytopathology* 31, 1941 (25).

Investigations over a period of 12 years in forest plantings of White and Red Pines show that there is a definite relation between the way in which the roots are placed in the ground and root, root-crown, and butt diseases. Although the reactions to these parasites may be accentuated by abnormal biological and other soil factors and by lack of proper silvicultural practices, the age of the tree and the way in which its roots are placed in the soil at the time of transplanting undoubtedly play a very important part in influencing its susceptibility to such diseases.

44.3 : 12.25 : 12.21 : 42.33. PHILLIPS, E. P. **Control of crop and plant diseases. Annual report of the Division of Botany and Plant Pathology.** *Fmg. S. Afr.* 15, 1940 (519–20). R.A.M. 20 (150).

During a severe summer outbreak of disease on *Pinus* species in the Sabie Forest Reserve Union of South Africa, *Diplodia pinea* was found in a viable condition on all affected trees, on fallen needles, on thinnings cut out two years before, and on standing trees that had been dead for four years. The heaviness of the attack was put down to damage caused by a severe hailstorm followed by a period of misty weather. The effects of the disease were visible six weeks after the storm, and by three months considerable patches of trees had died.

44.3 : 12.25 : 12.21. WOLF, F. A., and BARBOUR, W. J. **Brown-spot needle disease of**

Pines. *Phytopathology* 31, 1941 (61–74). [Duke University, Durham, N.C.]

A review of present knowledge of the brown-spot needle disease [*For. Abs.* 1 (242)], which most commonly affects *Pinus palustris* but has also been recorded on 11 other species of *Pinus*, is followed by an account of original studies on its developmental morphology and growth in culture. The taxonomy of the fungus is discussed and it is concluded that the correct names are *Lecanosticta acicola* (Thüm.) Syd. for the conidial and *Systremma acicola* (Dearn.) Wolf and Barbour, comb. nov., for the ascigerous stage. Studies of the life history and dissemination of the fungus indicate that controlled fires are the best means of disease control in this instance.

44.3 : 12.25 : 12.21. CUMMINS, G. B. **Descriptions of tropical rusts—III.** *Bull. Torrey bot. Cl.* 67, 1940 (607–13). R.A.M. 20 (81).

An annotated list of 21 Guatemalan rusts, including *Peridermium montezumae* sp. nov. from *Pinus montezumae*.

44.3 : 12.25 : 12.21 : 12.26–8. HARRIS, T. H. **The sampling of *Ribes* populations in blister rust control work.** *J. For.* 39, 1941 (316–23). [Bureau of Entomology and Plant Quarantine, U.S.D.A.]

Information on the distribution of *Ribes* for use in planning its effective eradication is obtained in the Western White Pine region by means of a 5-per-cent. 'check' survey along parallel strips 1 rod wide and 5 chains apart, the data being recorded by contiguous $\frac{1}{40}$-acre transects along the strip. Data collected include a record of the *Ribes* population and the size of each bush in linear feet of live stem, this being the factor on which control standards are based. Data and topography are sketched on a field map. There are three classes of checking, related to the progress in eradication work, known as advance, regular and post checking. A high degree of accuracy is required in this work.

44.3 : 12.25 : 12.21. HAHN, G. G. **New reports on *Adelopus gäumanni* on Douglas Fir in the United States.** *Plant Dis. Reptr.* 25, 1941 (115–7). [Bureau of Plant Industry, U.S.D.A.] L.S.

Additional records are given of the occurrence of *Phaeocryptopus* (*Adelopus*) *gäumanni* on Douglas Fir in New England plantations and in its natural range in the Rocky Mt. and Pacific Coast States. [Cf. *For. Abs.* 2 (194) and the references there cited.]

44.3 : 12.25 : 12.21. IOWA. **Report on agricultural research for the year ending 30th June, 1940. Pt. I. Project reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames. [1940?]. [Forestry Section pp. 184–8.]

While none of the spray materials tested was completely successful for control of *Phomopsis* blight of Red Cedar, 3–4–50 Bordeaux gave the best results (p. 186).

44.3 : 12.26–8 : 42.32. ROTH, E. R. **Top rot in snow-damaged Yellow Poplar and Basswood.** *J. For.* 39, 1941 (60–2). [Bureau of Plant Industry, U.S.D.A.]

Of the trees examined 27 per cent. of the Yellow Poplar and 8 per cent. of the Basswood were materially damaged by snow, and within a species it appears that the less vigorous trees are more subject to such damage. This study indicates that the relative severity of snow damage by species may vary with storm conditions. Ninety-two per cent. of the damaged Yellow Poplar showed active decay and it appears that most of this is caused by *Collybia velutipes*. Measurements indicate that rot extends down the stem 3 times as fast as upward and that there is about twice as much discoloration as rot. In a few cases rot has penetrated as much as 72 in. in the 44 months since damage occurred.

44.3 : 12.26–8 : 12.21 : 31.42.11. IMAZEKI, R. **Observations on Japanese fungi (V.)** *J. Jap. Bot.* 16, 1940 (583–91). R.A.M. 20 (136).

An annotated list of 6 wood-decaying *Fomes* species collected in Japan, including *F. fastuosus*, causing pocket rot of *Melia azedarach* var. *japonica*, and *F. hamatus* (*F. senex* var. *hamatus*), causing a white rot of *Castanea crenata* and *Castanopsis cuspidata*.

44.3 : 12.26–8 : 12.21. HOWARD, F. L., and CAROSELLI, N. E. **The role of tree injection in the control of bleeding canker of hardwoods.** *Abstract* in *Phytopathology* 31, 1941 (12).

Bleeding canker, previously reported only on Maple [cf. *For. Abs.* 2 (192)], has been found on Beech, Elm, and at least 2 species of Oak. 'Helione orange', a proprietary basic yellow

dye, plus a penetrant, has been shown to inhibit the growth of *Phytophthora cactorum* and other pathogenic fungi *in vitro*, and to inactivate the toxin formed by them. Of a number of diseased Maple and Beech trees injected with this preparation in 1939 and 1940, 85·4 per cent. have failed to yield the pathogen, have inactive cankers, and are forming callus tissue. Studies on the relationship of the point of injection, dosage, and the distribution of the chemical in the tree, have shown that infected vascular and cambial tissues can be adequately reached.

44.3 : 12.26–8 : 12.21. DAVIDSON, R. W., CAMPBELL, W. A., and LORENZ, R. C. **Association of *Stereum murrayi* with heart rot and cankers of living hardwoods.** *Phytopathology* 31, 1941 (82–7). [Bureau of Plant Industry, U.S.D.A.]

Isolations from decay in living Yellow and Paper Birch showed *Stereum murrayi* to be one of the heart-rotting fungi occasionally present. The fungus was isolated from a canker on Yellow Birch and one from Sugar Maple and also from incipient decay in Red Maple. Sporophores were found associated with trunk cankers and heart rot of Ironwood, Beech, and Striped Maple. *S. murrayi* apparently enters living trees through dead branch stubs or injuries either near the base or in the upper trunk. Survey of fungi causing decay in northern hardwoods is not sufficiently advanced for a definite statement of the importance of *S. murrayi* as compared with other decay species, but on some areas in the Lake States where cull studies were initiated it was occasionally isolated from heart rot of merchantable Yellow Birch. *From authors' summary.*

44.3 : 12.26–8. KOBAYASHI, Y. **On the abortive canker-like body on Birch from Japan.** *J. Jap. Bot.* 16, 1940 (684–8). [Jap.] Pl. Sci. Lit. 13 (5), (13).

44.3 : 12.26–8 : 12.21 : 31.8. CAMPBELL, W. A., and DAVIDSON, R. W. **Red heart of Paper Birch.** *J. For.* 39, 1941 (63–5). [Bureau of Plant Industry, U.S.D.A.]

Torula ligniperda was isolated from 80 per cent. of red heart samples, and other non-decay-producing fungi and a bacterium were also isolated. Red heart occurred in both seedlings and sprouts in about the same amounts provided butt rot was absent. Stump wounds in sprouts, or surface wounds that dried quickly, did not increase the amount of red heart provided no decay was present. Decayed trees had more red heart than trees uninfected by wood-rotting fungi. Most trees 50 years old, regardless of condition, had red heart, and old red heart was often soft and brashy. *From authors' summary.*

44.3 : 12.26–8 : 12.21 : 12.11.3. GRAVES, A. H. **Breeding work toward the development of a timber type of blight-resistant Chestnut. Report for 1939.** *Bull. Torrey bot. Cl.* 67, 1940 (773–7). R.A.M. 20 (140).

Lists are given of the Chestnut species, varieties, and hybrids grown in co-operative plantations in Connecticut and at the Brooklyn Botanic Garden in connexion with breeding work for resistance to *Endothia parasitica*. Though seedlings of *Castanea sativa* of European origin tend to die back in winter and are susceptible to the disease, an attempt is being made to combine this stock with the American material because of its exceptionally vigorous habit of growth.

44.3 : 12.26–8 : 12.21. DUNN, S. **Rust causing injury to Ash trees in New Hampshire.** *Plant Dis. Reptr.* 24, 1940 (394). R.A.M. 20 (138).

Ash trees in south-eastern New Hampshire, especially around Portsmouth, have been severely affected during the past two seasons with *Puccinia peridermiospora*, which has caused almost complete defoliation of some trees. The stage on the alternate host was found in *Spartina patens*.

44.3 : 12.26–8 : 12.21. LUTTRELL, E. S. **Tar spot of American Holly.** *Bull. Torrey bot. Cl.* 67, 1940 (692–704). [Duke University, Durham, N.C.] O.B.D.

An account is given of a common leaf-spot disease of *Ilex opaca* and of the morphology and life history of the pathogen. The latter, first called *Rhytisma curtisii* B. & Rav. and later *Macroderma curtisii* (B. & Rav.) v. Höhn., is transferred to the genus *Phacidium* as *P. curtisii* (B. & Rav.) Luttrell, and its description is emended.

44.3 : 12.26–8 : 12.21 : 23.27. WALTER, J. M., and MOOK, P. V. **Transmission of the Planetree *Ceratostomella* in asphalt wound dressings.** *Abstract* in *Phytopathology* 31, 1941 (23–4).

Tests showed that this fungus survived in a number of popular asphalt wound dressings.

Two kinds of dressing that prevented growth of the fungus were found to be toxic to Plane cambium. When 12 brands of wound dressings containing sawdust infected with *Ceratostomella* were applied to pruning wounds on London Planes infections developed from 7 asphalt dressings, the percentage of treated wounds that became diseased varying from 36 to 100. These results indicate the need for dressings that are both antiseptic and non-injurious to the cambium.

44.3 : 12.26–8 : 12.21. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

A white powdery mildew similar to *Microsphaera quercina* attacked *Quercus robur* on an epidemic scale. *Q. mirbeckii* and *Q. cerris* appeared relatively immune and *Q. palustris*, *Q. serrata* and *Q. sessiliflora* completely immune (p. 23).

44.3 : 12.26–8 : 12.21. LUTTRELL, E. S. ***Morenoella quercina*, cause of leaf spot of Oaks.** *Mycologia* 32, 1940 (652–66). R.A.M. 20 (95–6).

A leaf spot of Oaks caused by *M. quercina* is widely distributed throughout the south-eastern region of the United States. In the Duke Forest the species affected are the Red Oaks *Quercus borealis* var. *maxima*, *Q. velutina*, *Q. marilandica*, *Q. coccinea*, *Q. rubra*, and *Q. phellos*, the White Oaks *Q. alba* and *Q. stellata* appearing to be immune. Elsewhere the disease occurs on *Q. rubra*, *Q. pumila*, *Q. myrtifolia*, and also on the White Oaks *Q. geminata*, *Q. virginiana*, *Q. virens*, *Q. minima*, *Q. chapmani*, and *Q. stellata*. The disease is most apparent on young trees. Affected leaves are not shed prematurely, but photosynthesis is impaired and severe infection for several seasons reduced the vitality of seedlings. On older trees the disease is not of appreciable importance. The fungus is described in detail.

44.3 : 12.26–8 : 12.21. ORSENIGO, G. Osservazioni sull' immunità della quercia all' oidio. [**Observations on the immunity of Oak to *Microsphaera quercina* Burr.**] *Riv. Patol. veg.* 29, 1939 (367–74). [It.it.] I.M.I.

From cultures in sap extracts it appears that special substances inhibiting the germination of the conidia of *Microsphaera quercina* are formed in *Q. robur* leaves attacked by this fungus. No such inhibition was observed when using the extract of healthy leaves from infected trees.

44.3 : 12.26–8 : 12.21. METCALFE, G. **The watermark disease of Willows. I. Host-parasite relationships.** *New Phytol.* 39, 1940 (322–32). [Botany School, Cambridge.] O.B.D.

(i) In addition to *Bacterium salicis* Day, three other bacteria have constantly been isolated from watermarked Willow wood. The bacterial population of diseased wood changes with time; *B. salicis* is inactivated after the first year and there is a second invasion of the wood by the three associated organisms, leading to the complete permeation of all the tissues by bacteria. (ii) The distribution of bacteria in the wood and the pathological effects are described in detail. (iii) The infection of healthy wood, and the spread of the bacteria in such wood, are discussed in relation to the persistence of the disease in the tree from year to year. *Author's summary.*

44.3 : 12.26–8 : 12.21. BREWER, E. G. **The fight for the Elms: review of progress made in the campaign against the Dutch Elm disease.** *Amer. Forests* 47, 1941 (22–5).

The infection region lies roughly within an 80-mile radius of Lower Manhattan. The results of the last three years' scouting and eradication of diseased trees have been noteworthy, but the campaign still labours under certain handicaps arising from its being supported largely from relief instead of regular departmental appropriations.

44.3 : 12.26–8 : 12.21. SMUCKER, S. J. **Susceptibility of *Planera* and several Elm species to *Ceratostomella ulmi*.** *Abstract* in *Phytopathology* 31, 1941 (21).

Results based on extent of die-back of the main leader at the end of the growing season showed that *Ulmus laevis*, *U. procera*, *U. japonica*, and the 'Mormon Elm' were less susceptible than *U. americana* and *U. foliacea*. *U. foliacea* var. Christine Buisman was highly resistant, and *U. pumila* and its vars. *pinnato-ramosa* and *arborea* were slightly susceptible. Three trees of *Planera aquatica*, a new host genus for *C. ulmi*, developed pronounced wilt and considerable die-back shortly after inoculation with the fungus.

44.3 : 12.26–8 : 12.21 : 31.1. BANFIELD, W. M. **Relation of vessel length at infection points to extent of vascular invasion in American Elm by *Ceratostomella ulmi*.** *Abstract* in *Phytopathology* 31, 1941 (2).

Vessel length in *Ulmus americana* varies

progressively from a few centimetres in the new shoots to many metres in the bole. The extent of vascular invasion that developed from June infections with *Ceratostomella ulmi* at various points in standing trees was markedly influenced by vessel length at the point of treatment, all treatments in the bole being followed by extensive vascular invasion, while infections 1–4 in. from the tip of new shoots produced no disease symptoms and invasion was limited at the end of 2 years to an average of 8·7 in. In trees 60 ft. high, girdled every 5 ft., injected at stump height in June, and left standing all the season, invasion was limited to several feet.

44.3 : 12.26–8 : 12.21 : 13.2. RANKIN, W. H., PARKER, K. G., and COLLINS, D. L. **Dutch Elm disease fungus prevalent in bark-beetle-infested Elm wood.** *Abstract* in *Phytopathology* 31, 1941 (19).

Samples of Elm wood infested by the over-wintering brood of *Scolytus multistriatus* were collected at random from widely separated stations over a large area in New York State where Dutch Elm disease has existed for 2 or more years. Beetles carrying *Ceratostomella ulmi* were obtained from 38 per cent. of the samples, which were representative of over 100,000 dead and dying Elms and Elm wood on the ground collected at over 30,000 locations in the same area. The average annual incidence of Elms found dying of the disease in this area is only about 1 in 3 sq. miles. The prevalence of sources of inoculum and the low incidence of Elms killed by the fungus seem to indicate either low efficiency for the beetle as a vector or a critical balance requisite for infection that is rarely satisfied.

44.3 : 12.26–8 : 12.21 : 13.2. COLLINS, D. L., PARKER, K. G., and DIETERICH, H. **Uninfected Elm wood as a source of the bark beetle (*Scolytus multistriatus* Marsham) carrying the Dutch Elm disease pathogen.** *Bull. Cornell agric. Exp. Sta.* No. 740, 1940. pp. 14.

Up to 15 per cent. of the specimens of *Scolytus multistriatus* collected in the field in southeastern New York were found to be carrying *Ceratostomella ulmi*, and up to 74 per cent. of the progeny of beetles, that had been artificially infested with spores and allowed to enter healthy wood, were carrying spores when they emerged. All dead or dying Elm wood suitable for the breeding of *S. multistriatus* is thus a potential source of inoculum from which the Dutch Elm disease pathogen may be spread by emerging beetles. *From authors' summary.*

44.3 : 12.26–8 : 12.21 : 13.2. HOFFMAN, C. H., and MOSES, C. S. **Mating habits of *Scolytus multistriatus* and the dissemination of *Ceratostomella ulmi*.** *J. econ. Ent.* 33, 1940 (818–9). R.A.M. 20 (94).

Experiments indicate that a single male of *S. multistriatus* contaminated with *C. ulmi* may distribute the fungus to several brood burrows on entering them to mate with the females. Of the brood burrows containing larvae 79 per cent. yielded the pathogen, as against only 25 per cent. of those without them. In these tests the males furnished the sole source of inoculum.

44.3 : 12.26–8 : 12.21 : 13.2. BUCHANAN, W. D. **Ambrosia beetle, *Xylosandrus germanus*, transmits Dutch Elm disease under controlled conditions.** *J. econ. Ent.* 33, 1940 (819–20). R.A.M. 20 (94).

X. germanus was observed in the field to enter Elm logs, felled trees, exposed roots, stumps, and chemically killed trees infected with *Ceratostomella ulmi*, as well as similar material free from the fungus. In 1936, 2 out of 826 adults taken from the surface of Elm trap trees were found to be contaminated, and experiments were undertaken to determine whether *C. ulmi* could be transmitted by the beetles to healthy logs and trees. When the beetles were allowed to move freely from one battery jar containing infected Elm wood to another with sound material, the fungus was later recovered from 16 out of 94 samples of the latter, as well as from 3 out of 31 beetles taken directly from the diseased wood into which they had bored. Contaminated beetles were liberated, to the number of 250 per tree, on 6 healthy 5-year-old Elms enclosed in muslin cages. They made an average of 11·3 holes per tree, all in the trunks, and *C. ulmi* was isolated from 5 of the trees, though only one of these developed typical symptoms of the disease.

44.3 : 12.26–8 : 12.21. KELSHEIMER, E. G., and MAY, C. **Prevalence of Elm dieback caused by *Dothiorella ulmi*.** *Plant Dis. Reptr.* 24, 1940 (369–70). R.A.M. 20 (140).

A table is given to show the relative prevalence of die-back caused by *D. ulmi* among the wilt diseases of Elms between 1930 and 1938 in those parts of New York, Connecticut, New

Jersey, Ohio, Maryland, Pennsylvania, Indiana, and West Virginia, where scouting for Dutch Elm disease has been carried out. *D. ulmi* has been recorded from 31 States, the District of Columbia, and Canada.

44.3 : 44.4 : 13.2 : 13.15. LEACH, J. G. **Insect transmission of plant diseases.** McGraw-Hill Book Co., Inc., New York and London. 1940. pp. 615.

There must be few plant pathologists who have not come to realize how artificial, though in many ways convenient, is the distinction made between the study of diseases of plants arising from non-parasitic causes or from the action of plant parasites, and those of animal and especially insect origin. The distinction is necessary because it is almost impossible for any one person to find time adequately to investigate all kinds of plant diseases and because university training conveniently turns out either botanists or zoologists but not the all-round biologist who might be able to deal adequately with both the plant and animal kingdoms. The inter-relationships of these kingdoms are so close, however, that the zoological botanist or botanical zoologist is a necessity if problems in the development of the biome, such as are frequently raised in plant pathology, are properly to be understood. The subject of this book includes some of the more important and interesting of these botanical-zoological problems. Plant pathological research has proceeded along lines which have necessitated their study. Work on virus diseases, for instance, provides many examples of this. But until now no attempt has been made to draw the whole subject together conveniently in one book.

One of the virtues of this work is that a very broad view is taken of the subject. In the three opening chapters the reader is led to realize the intimate relationship that exists between insects and plants and the importance of this in spheres other than the development of plant disease. The insect transmission of plant diseases is thus seen against its proper background, namely the general symbiotic relationships of insects and plants in the plant-animal association which constitutes the biome. The following seven chapters are devoted to the actual subject of disease transmission by insects. Quite apart from their importance to the student, these provide most interesting reading and should be attractive to any layman or amateur biologist who takes a proper interest in the world of living organisms of which he forms a part. The insect-transmitted diseases are grouped according to the nature of the disease-causing organism. Toxigenic insects, and insects and bacterial diseases, fungus diseases, virus diseases and diseases due to phytopathogenic protozoa are thus dealt with. A chapter is also given to mites, nematodes and other small animals as vectors of plant diseases.

Following upon this are two chapters devoted to the anatomy and physiology of plants in relation to infection and insect vectors and the anatomy and physiology of insects in relation to the transmission of plant diseases. These chapters are necessarily brief and give the minimum necessary for the student to have an adequate understanding of the subject. The nature of the inocula of plant pathogens transmitted by insects and the feeding and breeding habits of insects in relation to this transmission are discussed in two further chapters. An interesting chapter which gives a comparative survey of the insect transmission of animal diseases follows and a final chapter is devoted to methods useful in the study of the subject with which the book is concerned.

This is essentially a students' book and is intended to help bridge the artificial gaps which usually exist between the related sciences of botany and zoology, at least in so far as the development of disease is concerned. Fundamentally it is ecological, as is a great deal of pathological study. It should help to give a better balance, not only to such study, but to ecological work in general. Foresters will find much of interest to them, although tree diseases arise only as part of the general discussion. Certainly no forest pathologist, whether entomologist or botanist, should be without reference to this work.

The book is well produced. The illustrations are clear and adequate. Literature references are given to each chapter so that there is no excuse for failure to do further reading where this is necessary, as must frequently be the case. The style of writing is clear and good and the author is to be congratulated on having produced an attractive and useful book. W. R. DAY.

44.4. *Virus Diseases*

44.4 : 12.26–8. SWINGLE, R. U., TILFORD, P. E., and IRISH, C. F. **A transmissible**

mosaic of American Elm. *Abstract* in *Phytopathology* 31, 1941 (22).

A mottled-leaf condition resembling a virus disease was discovered on American Elm near Cleveland, Ohio, in 1927, and trees with similar symptoms were found later in this and other eastern States. So far none of the trees has died, but diseased trees usually decline in vigour from year to year and become unsightly from thinning of foliage and death of individual branches. The disease has been successfully transmitted by grafting diseased bark on to healthy trees.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

45.12 : 12.25 : 13.2. ISAAC, R. **Mice and conifers.** *Amer. Forests* 47, 1941 (32–3).

Girdling damage caused by *Microtus* and *Pitymys* is discussed using data from a recent survey in Connecticut. Strychnine is ineffective in the control of these mice. Details of a perfected control procedure may be obtained from the Fish and Wildlife Service of the U.S. Department of the Interior.

45.12 : 13.2. MIDDLETON, A. D. **The control and extermination of wild rabbits.** Bureau of Animal Population, Oxford University. 1940. pp. 27.

It is suggested that an efficient and economical procedure for exterminating rabbits over wide areas can be organized as follows: (*a*) A carefully planned trapping, ferreting, snaring, and netting attack, made in the autumn and early winter, to take off the majority of the rabbits. (*b*) Thorough blocking of all holes in burrows and warrens immediately following this, to limit the number of holes in use by survivors. (*c*) Extermination of the remaining potential breeding stock by any means available, the cyanide spooning method being particularly suitable for this purpose. (*d*) A maintenance service for destroying survivors and checking reinfestation continued as long as necessary. (*e*) Special steps for fencing in warrens on scrub areas or derelict land to be taken, when possible, when complete extermination is temporarily impossible. *From author's summary.*

45.3. *Insects*

45.3. SHEPARD, H. H. **The chemistry and toxicology of insecticides.** Burgess Publishing Co., 426, South Sixth Street, Minneapolis, Minn. 1939, reprinted 1940. pp. 383. [University of Minnesota.] P.R.

The contents of this book are well indicated by the chapter headings which include:—history of insecticides; principles of insecticide toxicology; quantitative toxicology of insecticides; stomach poisons: arsenicals; stomach poisons: non-arsenical inorganic compounds; contact insecticides I: sulphur and copper compounds; contact insecticides II: adjuvants, oils and their derivatives; plant derivatives and related compounds; insect fumigants; and miscellaneous chemical control.

45.3. FELT, E. P., and BROMLEY, S. W. **New insecticides and spreaders on shade trees.** *J. econ. Ent.* 33, 1940 (247–9). R.A.E. A29 (118–9).

The results are given of tests on a number of proprietary insecticides and spreaders applied as sprays against shade-tree pests.

45.3. HAMILTON, C. C. **Dormant season spraying—trees and shrubs.** *Circ. N.J. agric. Exp. Sta.* No. 389, 1939. pp. 4.

Oil and lime/sulphur sprays for winter spraying to control aphids, scale insects and spider mites.

45.3. GOBEIL, R. Les insectes forestiers. [**Forest insects.**] Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 9. [F.]

45.3 (71.4). LAMBERT, R. Les insectes forestiers du Québec 1940. [**The forest insects of Quebec, 1940.**] *La Forêt Québecoise* 3 (2; 3), 1941 (29–41; 29–45). [F.]

An account is given of the third annual survey, in 1940, of the forest insect pests of Quebec. The most destructive of these was *Diprion polytomum*, which, as in earlier years, was most plentiful in Gaspé County, causing 30–70 per cent. defoliation in Spruce stands. In several districts of the Province, the beneficial effects of the establishment of *Microplectron fuscipennis* could be noted. This parasite had been liberated systematically since 1933. *Pristiphora erichsonii*, the most serious pest of Larch, was more abundant than in 1939. Infestation was heaviest in the Otter Lake region, where stand defoliation was practically complete. On the other hand, there were a few districts where damage was negligible as a result of parasites. Chief among these were *Mesoleius tenthredinis* and *Bessa selecta*. Numerous other insect

pests of relatively small or of no economic importance were recorded on various tree species.

45.3 (729.5) : 31.43 : 13.2. MARTORELL, L. F. **Some notes on forest entomology IV.** *Carib. For.* 2, 1940–41 (80–2). [E.span.] [Agricultural Exp. Sta., Rio Piedras, Puerto Rico.]

Includes lists of tree species on which the termite *Nasutitermes costalis* Holmgren (*N. morio* Latr.) has been recorded in Puerto Rico. Also notes on other termites of lesser importance, on *Prepodes quindecimpunctatus* Olivier, which attacks the foliage of *Torrubia fragrans* (Dum-Cours) Standley, and on *Zethus rufinodus* Latr., a pest of fence posts.

45.3 : 12.25 : 13.2 (77.6). GRAHAM, S. A., and ORR, L. W. **The Spruce budworm in Minnesota.** *Tech. Bull. Minn. agric. Exp. Sta.* No. 142, 1940. pp. 27. [University of Minnesota.]

In spite of its common name, *Cacoecia fumiferana* favours Balsam Fir as a host species, and Spruce is only a second choice. The present bulletin discusses the amount of damage done by the insect, the effect of an outbreak on various host species, the course of an outbreak, effects of defoliation, tree reproduction after an outbreak, increase in fire hazard, the causes of an outbreak, and possibilities of control. Among the conclusions it is pointed out that silvicultural control measures, where they are possible, should be based on the following considerations:—(i) Natural forest succession in much of northeastern Minnesota leads towards a climax containing a very high proportion of Balsam Fir. (ii) Balsam Fir overtopped by Aspen, Birch or White Pine is not conducive to outbreaks; it is only after the tops of the Fir trees project into or above the upper canopy that conditions become particularly favourable for the insect. In the last outbreak, damage was very severe only in mature stands with more than 40 per cent. of Balsam Fir in the upper canopy and where such stands occurred over wide areas. (iii) Balsam Fir should be grown on as short a rotation as possible, preferably not more than 60–65 years. Short cutting cycles within the rotation period should reduce the period of susceptibility to the insect and help to avoid much of the loss from heart rot, which is prevalent in overmature trees. (iv) The danger of outbreaks may be reduced to a minimum by practices that prevent the development of susceptible types of stand. If this is impossible or undesirable, attempts should be made to keep the proportion of susceptible types low, to limit the size of individual areas of susceptible types to the minimum consistent with economic management, and either by cultural operations or logging to separate them by resistant stands or stands that will not become susceptible until later. (v) Sporadic outbreaks may occur on small favourable areas, but disastrous outbreaks have always been associated with wide areas of susceptible forest types. (vi) The measures suggested should prevent extensive outbreaks and give a better chance for the salvage of any timber killed by local outbreaks. The last is important because Balsam Fir deteriorates rapidly after death of the trees.

45.3 : 12.25 : 13.2. HOFMANN, C. Ein neues Kontaktstäubemittel ('Nemotan') gegen Nonne und Kiefernspanner. [**A new contact dust ('Nemotan') against the nun moth and the Pine looper moth.**] *Forstarchiv* 16, 1940 (8–11). [G.] R.M.I.

'Nemotan' is recommended as being quite as effective as the dinitro-o-cresol preparations previously used. It does not burn the spring shoots of Spruce and has a more lasting effect than the latter preparations. [Cf. *For. Abs.* 2 (330).]

45.3 : 12.25 : 13.2. TAMANUKI, K. **The bark-beetles attacking Spruce in southern Sakhalin.** *Publ. Sect. For. Sakhalin* 1940. pp. 64. [Jap.] R.A.E. A29 (96).

A key is given to the 24 bark beetles that attack Spruce in southern Sakhalin, together with notes on the morphology and bionomics of the more important of them.

45.3 : 12.25 : 13.2. BAIRD, A. B. **The Spruce sawfly parasite situation 1940.** *Pulp Paper Mag. Can.* 42, 1941 (159–61). [Dominion Parasite Laboratory, Belleville, Ont.]

1940 liberations in Canada and the U.S.A. of Spruce sawfly parasites obtained from the laboratory at Belleville, Ontario, are tabulated. It is pointed out that the value of parasites, particularly the cocoon parasite *Microplectron fuscipennis* and larval parasites *Exenterus* spp. and *Sturmia inconspicua*, is increasing markedly. A programme of future work is outlined.

45.3 : 12.25 : 13.2. GRYSE, J. J. DE. **A brief note on the so-called 'mysterious' disease of the Spruce sawfly.** *For. Chron.* 17, 1941

(43–4). [Division of Entomology, Science Service, Department of Agriculture, Ottawa.]

A disease of *Gilpinia polytoma*, which is thought possibly to be a virus but of which little is yet known, is found over most of the area infested by the sawfly and sometimes kills large numbers of the larvae. It has been particularly destructive to the 1940 larval population in New Hampshire and Vermont and to a lesser extent in Maine and New Brunswick.

45.3 : 12.25 : 13.2 (74.1). PEIRSON, H. B., and NASH, R. W. **Control work on European Spruce sawfly in 1939.** *Bull. Me. For. Serv.* No. 12, 1940. pp. 19.

The widespread nature of the *Diprion polytomum* outbreak in Maine seems to warrant an effort to establish parasites throughout the Spruce stands of the State. During the last two seasons *Microplectron fuscipennis* has been thoroughly distributed over most of this area. Although this parasite may become the dominant factor of control in some areas, it appears that it will not effect a State-wide control and that there is need for introducing other species of parasites.

45.3 : 12.25 : 13.2. SCHNEIDER-ORELLI, O. Die weisswollige Fichtenstammlaus *Pineus* (*Chermes*) *pineoides* Cholodk. **[The Spruce trunk aphid, *Pineus* (*Chermes*) *pineoides* Cholodk.]** *Schweiz. Z. Forstw.* 1940, No. 9. [G.] Repr. pp. 8. R.A.E. A29 (67).

Descriptions are given of the female and young larva of *Chermes* (*Pineus*) *pineoides* Cholodk., together with characters distinguishing these forms from those of *C.* (*P.*) *strobi* Htg. *C. pineoides* is anholocyclic on Spruce and does not produce winged forms. It has not been recorded in literature from Swiss forests, but the author has often observed it on trunks of Spruce, though not on young trees, and describes an infestation near Zürich on a Spruce trunk 16 in. in diameter uprooted by wind. Owing to its restricted capacity for increase, *C. pineoides* is of very much less practical importance than *C. nordmannianae* Eckst. (*Dreyfusia nüsslini* Börn). It is well protected under the bark scales, and in an experiment in 1940 a derris dust gave unsatisfactory control.

45.3 : 12.25 : 13.2 : 31.43. MITONO, T. **Insect pests boring into the stems of *Pinus*.** *Taiwan no Sanrin* No. 165, 1940. pp. 21–6. [Jap.] R.A.E. A29 (104).

A description is given of the adult of *Sipalus formosanus* Kôno, the larvae of which bore in the stems of weakened or fallen Pines (*Pinus taiwanensis* and *P. massoniana*) in Formosa.

45.3 : 12.25 : 13.2. TABATA, S., and TAMANUKI, K. **On the hymenopterous parasites of the Pine caterpillar, *Dendrolimus sibiricus albolineatus* Mats. in southern Sakhalin.** *Rep. cent. Exp. Sta. Sakhalin* No. 33 For., pt. 2, 1940. pp. 50. [Jap.] R.A.E. A29 (95).

Descriptions of 26 parasites and notes on the bionomics of some of them.

45.3 : 12.25 : 13.2. SCHWERDTFEGER, F. Bekämpfung und Prognose der Kiefernschonungs-Gespinstblattwespe, *Acantholyda erythrocephala* L. **[Control and prognosis of *A. erythrocephala* L.]** *Forstarchiv* 17, 1941 (57–61). [G.g.]

Heavy damage to young Pine stands is reported from a district east of Schwerin in Posen. Complete extermination of larvae was obtained from arsenical dusting by aeroplane using 50 kg. of poison dust per ha. A prognosis method based on the counting of larvae and eggs is recommended.

45.3 : 12.26–8 : 13.2 : 44.3 : 12.21. KATSUMATA, K. **On the control of the Scolytid, *Scolytoplatypus daimio* Blandf. and the disease, *Endothia parasitica* (Murr.) And. et And., of Chestnut.** *J. Plant Prot.* 27, 1940 (194–8). [Jap.] R.A.E. A29 (97).

S. daimio is a serious pest of Chestnut in the Ishikawa Prefecture, Japan, and may be a vector of the blight fungus. Nearly complete control of the adult beetles was obtained by whitewashing the stems up to a height of 3 ft. in April.

45.3 : 12.26–8 : 13.2. KAWADA, A., and SUENAGA, H. **On the Chestnut-bark miner, *Acrocercops* sp.** *Ōyō-Kontyū* 2, 1940 (192–201). [Jap.] R.A.E. A29 (99).

Chestnut, Willow, Pear, *Rhus*, and Oak are attacked in Japan by bark-miners of the genus *Acrocercops* that are identical in the morphology of all stages. The species infesting Chestnut is very injurious in Saitama Prefecture, and an account is given of its bionomics. The life histories of those attacking Willow, Oak, and *Rhus* are similar, but that of the Pear bark-miner is quite different.

45.3 : 12.26–8 : 13.2. MITONO, T. **A longicorn beetle destructive to Balsa tree.**

Taiwan no Sanrin No. 162, 1939. pp. 1–8. [Jap.] R.A.E. A29 (103).

Larvae of *Pachyosa perplexa* Pasc. have recently been observed to infest *Ochroma pyramidale* in Southern Formosa. The adult and larva are described and synonymy is discussed.

45.3 : 12.26–8 : 13.2. MITONO, T. **Insect pests feeding on the leaves of Balsa.** *Taiwan no Sanrin* No. 166, 1940. pp. 11–8. [Jap.] R.A.E. A29 (104).

Larvae of *Sylepta derogata* F. were observed feeding on leaves of *Ochroma pyramidale* in Formosa. All stages of the moth are described.

45.3 : 12.26–8 : 13.2. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

The spread of *Teragra guttifera* in *Populus deltoides* was controlled by painting pruning scars and larval holes with bitumen (p. 23).

45.3 : 12.26–8 : 13.2. GAMBRELL, F. L. **Rotenone-bearing insecticides for the control of the Elm leaf beetle, *Galerucella xanthomelaena* Schrank.** [*G. luteola* Mull.] *J. econ. Ent.* 33, 1940 (264–9). R.A.E. A29 (120).

Experiments in 1938 showed that sprays containing either 4 lb. of cubé powder (4 per cent. rotenone) or 6 lb. of lead arsenate per 100 U.S. gal. of water were effective when applied after more than half of the eggs had hatched. In 1939 sprays containing either 2–4 lb. of derris (about 5 per cent. rotenone) or 4–6 lb. of lead arsenate in 100 U.S. gal. of water gave satisfactory control if applied during or after the second week in June. In limited tests a 2·5 per cent. rotenone extract diluted to 1 : 400 gave a high degree of control of both larvae and adults. Field tests showed no appreciable difference between the effectiveness of ordinary derris and derris with an antioxidant, with the possible exception of their effect upon eggs: in two places the proportion of eggs failing to hatch was much greater after the use of the latter than after the former preparation, applied on the 6th and 9th of June, respectively. The advantages of rotenone and of lead arsenate preparations are compared.

45.3 : 13.2. *Tree Pest Leafl., Boston.* Nos. 42, 43, 46, 49 and 50. 1940.

Each of these leaflets gives a brief outline of the history and distribution, host trees, damage, description, life history and control of an insect that attacks species of forest trees. Those dealt with are: (42) the saddled prominent (*Heterocampa guttivitta* Walk.), (43) the satin moth (*Stilpnotia salicis* L.), (46) the Arborvitae leaf miners (*Yponomeutidae* and *Gelechiidae*), (49) the oystershell scale (*Lepidosaphes ulmi* L.), and (50) the Mountainash sawfly (*Pristiphora geniculata* Hartig).

45.3 : 13.2. NOLTE, H.-W. Kann der Puppenräuber (*Calosoma sycophanta* L.) eine Schädlingsplage beendigen? [**Can the pupal predator *Calosoma sycophanta* L. end an outbreak of pests?**] *Forstwiss. Cbl.* 62, 1940 (135–8). [G.] R.M.I.

The conclusion is reached that the *Calosoma* beetle may render good service if raised artificially and placed where it is most needed.

45.3 : 13.2. GREAT BRITAIN. **The Imperial Forestry Institute, University of Oxford. Sixteenth annual report, 1939–40.** Imperial Forestry Institute, Oxford. 1940. pp. 18.

The weevils *Otiorrhynchus singularis* L. (*picipes* F.), *Strophosomus coryli* F. and *Caenopsis fissirostris* Walt. have caused damage to Oak, Larch, Norway Spruce and Corsican Pine (p. 13).

47. COLLECTIVE INJURIES TO INDIVIDUAL TREE SPECIES

47 : 12.25. TOOLE, E. R., and BUCHANAN, T. S. **Little-leaf disease of Shortleaf and other Southern Pines.** *Plant Dis. Reptr.* 25, 1941 (117–9). [Bureau of Plant Industry, U.S.D.A.] L.S.

A map is given to show the present known distribution of this disease, the cause of which is as yet undetermined. In some places the actual or expected mortality has become great enough to justify fellings in *Pinus echinata* that are rather heavier than the normal cut.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52. Dendrometrie. **[Dendrometry.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 4. [F.]

52.4. *Measurement of Volume*

52.4. BRICHET, L. Évaluation rapide du volume des arbres sur pied. **[Rapid estimation of the volume of standing timber.]** *Bull. Soc. for. Belg.* 47, 1940 (168–71). [F.] Biol. Abs. 15 (6118).

Discussion of several rule-of-thumb formulae.

52.4 : 12.25 : 12.14.6 : 12.14.8 : 53. KORSUŇ, F. Procento kůry o větví u smrku. **[The bark and limb per cent. of Norway Spruce.]** *Lesnická Práce* 19, 1940 (23–31). [Cz.g.] Biol. Abs. 15 (6177).

Two hundred trees of *Picea abies* varying from 10·6 to 55·6 cm. in diameter had an aggregate volume of 89·6 cu. m., of which 7·9 cu. m. (8·8 per cent.) was bark and 12 cu. m. (13·4 per cent.) limbs. The bark per cent. and limb per cent. ranged for individual trees from 4·5 to 14·7 and from 3·2 to 35·9 respectively. Bark per cent. fell by about 1 for every 10 cm. increase in d.b.h. Limb per cent. rose by 2 for each increase of 0·1 in the d.b.h./height ratio.

52.43.2 : 52.43.3 : 52.46. STRUGNELL, E. J. **Enumeration figures and outturn figures.** *Malay. For.* 10, 1941 (20–3).

Differences between these two sets of figures are usually appreciable, and are due chiefly to peculiarities in the Malayan departmental regulations regarding enumeration, and to defect, which can be very serious in virgin evergreen forest.

52.46 : 33.02 : 81. WILSON, M. R. **Pulpwood cruising with less office compilation.** *Pulp Paper Mag. Can.* 42, 1941 (25–6). [Canadian International Paper Co.]

The cruising party consists of a compassman and a cruiser, and the system of cruising must be by line plot. The cruiser memorizes volume tables of the desired species and tallies from his caliper reading directly in volumes and not in diameters. Individual tree volumes are taken down by the compassman in a small adding machine called a Ve-Po-Ad, which is placed in his note book. After the tally is completed for the plot the stand per acre can be read directly from the instrument for each species. The number of trees of each species are recorded separately by the cruiser on a tally register and if diameter distribution data are required a separate diameter tally may be made for every fourth or fifth plot. The field procedure, office procedure and equipment used for this type of cruise are described briefly.

52.46 : 61. Inventaire et estimation des bois. **[Inventory and estimation of standing timber.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 15. [F.]

56. INCREMENT

56.02 : 07.7. REINEKE, L. H. **A new increment core instrument and coring wrinkles.** *J. For.* 39, 1941 (304–9). [Northeastern Forest Exp. Sta.]

Specifications and method of operation of an instrument designed to hold an increment core firmly in place for preparation and examination —that is the removal of excess material from both sides to reduce the core to a relatively thin section and permit differentiation of springwood and summerwood under the most favourable light conditions. Also description of core filing cards and carrying case, and useful information, based on experience, on sharpening and operation of increment borer.

56.02 : 11.21 : 09.2. DOUGLASS, A. E. **Estimated ring chronology 150-1934 A.D.** *Suppl.* to *Tree-Ring Bulletin* 6, 1939–40. pp. 6.

56.02 : 11.21 : 09.2. DOUGLASS, A. E. **Notes on the technique of tree-ring analysis, I.** *Tree-Ring Bulletin* 7, 1940–41 (1–8).

56.02 : 11.21 : 09.2. GIDDINGS, J. L. **The application of tree-ring dates to Arctic sites.** *Tree-Ring Bulletin* 7, 1940–41 (10–4).

56.02 : 11.21 : 09.2 : 01.6. SCHULMAN, E. **A bibliography of tree-ring analysis.** *Tree-Ring Bulletin* 6, 1939–40 (27–39).

56.02 : 11.21 : 09.2 : 12.25. LYON, C. J. **Intercorrelations between growth rates of conifers in northern New England.** *Tree-Ring Bulletin* 7, 1940–41 (24–6). [Dartmouth College, Hanover, N.H.]

56.02 : 11.21 : 09.2 : 12.25. WEAKLY, H. E. **Tree rings as a record of precipitation in western Nebraska.** *Tree-Ring Bulletin* 6, 1939–40 (18–9). [Bureau of Plant Industry, North Platte Sub-station, Nebraska.]

56.02 : 11.21 : 09.2 : 12.25. SCHULMAN, E. **Douglas Fir chronology in Santa Catalina Mountains, Arizona.** *Tree-Ring Bulletin* 7, 1940–41 (18–9). [University of Arizona, Tucson.]

56.02 : 11.21 : 09.2 : 12.25. FRITZ, E. **Problems in dating rings of California coast Redwood.** *Tree-Ring Bulletin* 6, 1939–40 (19–21). [University of California.]

56.02 : 11.21 : 09.2 : 12.25. SCHULMAN, E. **Climatic chronology in some coast Redwoods.** *Tree-Ring Bulletin* 6, 1939–40 (22–3).

56.02 : 11.21 : 09.2 : 12.25. MEYER, H. A. **Growth fluctuations of virgin Hemlock from northern Pennsylvania.** *Tree-Ring Bulletin* 7, 1940–41 (20–3). [Pennsylvania State College.]

56.02 : 11.21 : 11.41.3 : 12.25. AVERY, G. S., CREIGHTON, H. B., and HOCK, C. W. **Annual rings in Hemlocks and their relation to environmental factors.** *Amer. J. Bot.* 27, 1940 (825–31). [Connecticut College, New London.] O.B.D.

The annual rings of 15 Hemlock [*Tsuga canadensis*] trees averaging 147 years of age were measured along 3 typical radii and the data subjected to statistical analysis. The trees grew in two different habitats, 5 along a brook in a ravine abundantly supplied with moisture, and 10 on an adjacent dry rocky ledge. Growth correlations between brook and ledge trees show that despite the difference in available moisture there is a marked relationship between the more or less cyclic fluctuations in ring width in trees in the two different environments. Ring width in all but 11 of the last 63 years was greater for trees growing along the brook, indicating that the constantly greater water supply favoured the laying down of more wood in the brook trees. Except for a slightly higher content of organic matter in the ravine there was little difference between the two soils. Correlations of ring width with total August–February and total March–July rainfall show only a very slight positive relationship, and with mean March–July temperature a slight inverse relationship. These correlations are of little or no significance. The rainfall of a given growing season (March–July) had no more influence on ring width than that of the preceding fall and winter (August–February). Width of rings decreased with age of the trees, but this does not indicate that less wood is formed; calculations show that narrowing of the rings is more than compensated by the greater circumference of each successive ring. *From authors' summary.*

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57 : 12.26–8. BALDWIN, H. I. **Growth of hybrid Poplars.** *Fox Forest Notes* No. 26, 1941. p. 1.

The average height of surviving trees of each of ten hybrid poplars, developed by the Oxford Paper Co., is tabulated for each year since establishment, 1935–40 inclusive. The relatively slow growth of this planting is thought to be due to severe weed and grass competition. Andover, Rumford and Oxford clones showed the best survival (80, 90 and 90 per cent. respectively) after 6 years, with average height growth of 6·9, 6·9 and 7·8 ft. Better average growth was shown by Geneva (9·8 ft.), Strathglass (8·7 ft.), Androscoggin (8·3 ft.), and Rochester (8·3 ft.) with survival percentages of 70, 60, 20 and 70 respectively.

57 : 12.26–8 (59.5). DURANT, C. C. L. **The growth of Mangrove species in Malaya.** *Malay. For.* 10, 1941 (3–15).

Girth and volume growth data for a number of Mangrove species, based chiefly on measurements of permanent sample plots during the last quarter of a century.

57.0 : 12.25 : 21.0. MOORE, E. B., and WALDRON, A. F. **The growth of a Scotch Pine plantation in New Jersey.** *Tech. Note Div. For. Parks N.J.* No. 7, 1939. pp. 4. [Department of Conservation & Development, N.J.]

The volume growth in young stands was best following a heavy thinning, yet poor in comparison with Red and White Pine.

57.0 : 12.25 : 12.26–8 : 24.25. MOORE, E. B., and WALDRON, A. F. **A comparison of the growth of Oak and Pine in southern New Jersey.** *Tech. Note Div. For. Parks N.J.* No. 10, 1940. pp. 6. [Department of Conservation & Development, N.J.]

The available evidence indicates that in this region Pine is capable of producing higher yields than Oak.

57.0 : 12.26–8 : 24.25. MOORE, E. B., and WALDRON, A. F. **Growth of thinned and unthinned hardwoods on a cove site in the New Jersey highlands.** *Tech. Note Div. For. Parks N.J.* No. 8, 1939. pp. 4. [Department of Conservation & Development, N.J.]

In young stands composed of Ash, Red Maple, Tulip and Oak, the growth per cent. was considerably higher after heavy thinnings than in the unthinned controls.

57.0 : 12.26–8 : 24.25. MOORE, E. B., and WALDRON, A. F. **The growth of thinned and unthinned Sweet Gum in New Jersey.** *Tech. Note Div. For. Parks N.J.* No. 9, 1940. pp. 4. [Department of Conservation & Development, N.J.]

In young plantations the growth was satisfactory in both thinned and unthinned stands, but the growth per cent. was considerably higher in the former.

57.0 : 65.2 : 12.26–8 : 22.88.1. STOATE, T. N. **Jarrah stem distributions.** *Aust. For.* 5, 1940 (72–7).

The study is based on data from the virgin Jarrah forest in the Harvey Division in Western Australia. Although the curve for stem distribution was complex, that of crown areas against girth classes was of the normal type. The values for crown areas of girth classes were evolved from curves for crown spread and the numbers of trees in 18-in. girth classes, and normal curves were fitted for three types of Jarrah forest. Stem distributions were then calculated by dividing the values for crown areas taken from the curves by the corresponding mean crown areas of the different classes. Finally, calculated numbers of stems were plotted against 18-in. g.b.h. classes.

The approach from the viewpoint of crown area rather than the number of stems in a class simplifies the curve fitting since the data in this form correspond closely to the normal distribution. The stem distribution curve eventually obtained is still of a complex type and not readily expressible by a mathematical equation; but the fact that it has been derived partly from a normal crown-area distribution graph allows of assuming that its irregularities are not accidental and that stem distribution in virgin Jarrah does not follow a simple curve.

57.9 : 01.7. MAGYAR, J. A fatermési táblák szerkesztésének alapkérdései. **[Fundamental problems in the construction of yield tables.]** *Erdész. Kisérl.* 42, 1940 (1–105). [Hu.g.]

Using statistics from *Robinia pseudoacacia* stands in the Hungarian plain, a procedure of yield-table construction based on Baur's method is suggested, involving a number of refinements in the graphic determination of quality classes according to mean dominant height, and of volumes, basal areas, mean heights, and form factors.

57.9 : 12.25 : 65.5–6. CUMMINGS, L. J. **The relationship of normal to average Ponderosa Pine stands of north Idaho.** *J. For.* 39, 1941 (47–8). [U.S. Forest Service, Missoula, Mont.]

Statistical analyses of the field data obtained from correlation studies in the Ponderosa Pine type of north Idaho showed that average, well-stocked areas, as recognized by the Forest Survey type mappers, were stocked 38 per cent. of yield table normal, medium-stocked areas, 27 per cent., and poor-stocked areas, 15 per cent. of normal. *From author's summary.*

6 : 2. Aménagement et sylviculture. **[Management and silviculture.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 24. [F.]

60. GENERAL LAND MANAGEMENT

60.3. *Management of Different Classes of Forest*

60.31.2 (78.1). SMITH, L. F. **Farm woodlot management in Kansas.** *Circ. Kans. agric. Exp. Sta.* No. 201, 1940. pp. 28.

60.31.2 : 33.02. PRICE, W. H. **Forestry and engineering in using the forest crop.** *Paper Tr. J.* 111 (24), 1940 (31–4). [Weyerhaeuser Timber Co., Tacoma, Wash.] P.R.

The practical viewpoint of private forest managment toward the production of timber for wood pulp is given. The advantages and limitations of the Pacific northwest timber resources in the establishment and operation of pulp and paper mills are discussed. *Author's summary.*

60.31.2 : 94.34. **Private estates and forestry.** *Timb. Tr. J.* 156, 1941 (273).

Report of an address by Major C. P. Ackers.

60.31.2 : 94.4 (73). COPE, J. A. **Farm woodland owners' co-operatives.** *J. For.* 39, 1941 (192–6).

Discussion of the factors governing the successful working of forest co-operatives, with particular reference to the farm woodlands in the north-eastern United States.

60.31.2 : 97.2 (71). SISAM, J. W. B. **Canadian farm woodlots.** *Quart. J. For.* 35, 1941 (59–61).

63. ROTATION

63 : 12.25 : 22.88.2. BARNES, G. H. **Cutting ages for second growth stands of Douglas Fir and Western Hemlock of the Lower Fraser River valley.** *Res. Note B.C. For. Serv.* No. 8, 1941. pp. 5.

From growth data obtained from sample plots, it is recommended that for lumber production second-growth stands of pure Douglas Fir or Western Hemlock, or of mixtures of these species, should not be cut before reaching 120 years on the best sites and not before 140 years or more on the poorer sites.

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

64 : 12.26–8 : 21.0. GRANT, T. J. **A method for judging quality of planting sites for Black Locust, based on field clinic data.** Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. No. *SCS–TP–34*, 1940. pp. 15. [Soil Conservation Service, U.S.D.A.]

The results of this study indicate that an estimate of conditions favourable or unfavourable for Black Locust growth may be obtained by the measurement of soil profile, sheet erosion, litter cover, plant cover and species composition, and that sites unsatisfactory for Black Locust due to poor internal drainage may best be identified from the soil profile.

66. POSSIBILITY. SUSTAINED YIELD. YIELD REGULATION

66 : 96.3 (71). MILLER, G. L. **Sustained yields from Canadian forests—the responsibility of a Provincial Forest Service.** *For. Chron.* 17, 1941 (17–21).

66 : 96.3 (71). CAMERON, D. R. **The establishment of sustained production from Canadian forests for the support of permanent forest industries. Dominion responsibility and program.** *For. Chron.* 17, 1941 (22–7).

66 : 96.3 (71). AVERY, B. F. **The establishment of sustained production from Canadian forests for the support of permanent forest industries. Attitude of forest industry in Eastern Canada.** *For. Chron.* 17, 1941 (28–9).

66 (71.21). ROBERTS, E. H. **Factors which govern the selection of practical sustained yield working circles in Saskatchewan.** *For. Chron.* 17, 1941 (30–3).

66 : 96.3 (71). MANNING, E. C. **Sustained yield from Canadian forests for the support of permanent forest industries. Provincial responsibility and program.** *For. Chron.* 17, 1941 (34–7).

66 (71.1). SMITH, S. **The introduction of sustained yield in Canadian forests.** *For. Chron.* 17, 1941 (38–42).

A symposium of papers discussing the interests, policies and responsibilities of federal and provincial forest services and the forest industries in the administration and management of Canadian forest lands with the object of sustained production.

9. FOREST POLICY

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST. FOREST INFLUENCES

91.1. *Rural preservation. Reserves. National Parks. Plant and Animal Protection*

91.1 (498) : 92. DEMETRESCU, I. C. Naturschutzbestrebungen in Rumänien. **[Efforts for nature protection in Rumania.]** *Z. Weltforstw.* 7, 1940 (760–9). [G.f.] [Institutul de Cercetări şi Experimentatie Forestieră, Bucarest.] P.R.

Includes an account of the relevant legislation. Nature protection is administered under the Ministry of Agriculture and Lands.

91.1 (73) : 34.3 : 92. RUTHERFORD, R. M. **Wildlife restoration through State and Federal cooperation under the provisions of the Pittman-Robertson Act.** *J. For.* 39, 1941 (157–60.)

91.1 (74.8). HOUGH, A. F. **Natural area established in northwestern Pennsylvania virgin forest.** *Ecology* 22, 1941 (85–6). [Allegheny Forest Exp. Sta.]

A permanent nature reserve of 4,131 acres of essentially virgin Hemlock/Beech forest has been constituted in the Allegheny National Forest. The area is to be administered by the U.S. Forest Service and will be divided into two parts for the purposes of scientific study and public recreation, respectively.

91.1 (91.4) : 34.3. FRANCO, F. **Wild life in the Philippines.** *Philipp. J. For.* 3, 1940 (203–9). [Bureau of Forestry, Philippines.]

91.4. *Value of the Forest in Hygiene and Recreation*

91.4 (91.4). CRUZ, E. DE LA, and LANSIGAN, N. P. **Forest recreation** [with special reference to the Philippines]. *Philipp. J. For.* 3, 1940 (151–68). [Bureau of Forestry, Philippines.]

91.4 (91.4) : 12.2. SULIT, M. D. **Plants to be avoided or handled with care in the forest.** *Philipp. J. For.* 3, 1940 (177–89). [Bureau of Forestry, Philippines.]

91.4 (91.4) : 13.2. MESA, A. DE. **Forest pests man should avoid.** *Philipp. J. For.* 3, 1940 (191–201). [Bureau of Forestry, Philippines.]

91.4 (91.4) : 34.25 : 12.21. ROLDAN, E. F. **Some Philippine edible and poisonous gilled mushrooms and how to know them.** *Philipp. J. For.* 3, 1940 (211–40). [Bureau of Forestry, Philippines.]

91.7. *The Forest as a Source of Raw Materials*

91.7 : 99. WINSLOW, C. P. **Forest products and defense.** Forest Products Laboratory, Madison, Wis. No. *R*1250, 1941 (pp. 9). P.R.

91.8. *The Forest as a Source of Employment and Income*

91.8 : 24 (485). KLEVENFELDT, E. Skogsvårdsstyrelsens röjningsarbeten för arbetslöshetens bekämpande i norra Bohuslän. **[The County Forestry Board's stand improvement work for the relief of unemployment in northern Bohuslän.]** *Skogsägaren* 17, 1941 (8–10). [Sw.]

Between 1936 and 1939 the Göteborg-and-Bohus County Forestry Board received grants from the State and from the County Council (landsting) that were to be used in part for the dual purpose of unemployment relief and stand improvement in northern Bohus. In the first year the Board met all costs for two days, after which the owner paid 20 per cent. of the cost for the third and fourth, and 50 per cent. of the cost for the fifth and succeeding days. This, however, created too heavy a demand upon the grants; in the following year only the first day's work was done free, and by the last year the State grant was exhausted and only a County Council grant of 50 per cent. of the costs could be offered. The actual work was done under the auspices of the County Forestry Board by crews of 4 unemployed directed by a foreman appointed by the Board. Owners were required to remove all felled, unbarked Pine logs before the following May, and to cut and remove all trees marked but not felled by the crews. In default of this an owner was pledged to pay to the Board the full expenses of the work. Cuttings were made in young stands up to 20 years old, as owners would have had difficulty in making such operations pay. Over the period 1936–39 work of this nature was carried out on 649 holdings with a total area of 2,446 ha. for a cost of 36,135 Kr. The average cost per ha. was thus 14·77 Kr. The workers' wages averaged 60–65 öre per hr.

and those of the foreman 90 öre per hr. Costs were distributed between the State grants, the County Council grants, and the owners as 38, 37 and 25 per cent., respectively. The obligation of the owner to remove felled stems and to fell and remove marked trees proved difficult to enforce without considerable expense. It is suggested that better control should be achieved if the timber were cut up by the workers, measured by the foreman, and the expense of this work debited at current rates to the owner.

92. FOREST LAW

92 (410). DAVEY, R. **Timber and growing trees.** *J. Land Agents' Soc.* 40, 1941 (76–8).

Summary of orders and directions issued under the Defence Regulations.

92 (43.6 : 43.1–5) : 09.1. ALBRECHT, F. Aus der Wald-, Holz- und Forstordnung für die vorderösterreichischen Lande vom 7 Dezember 1786. **[From the Woodland, Timber and Forest Ordinance of the Swabian provinces of Austria (now Baden and Württemberg) of 7th Dec., 1786.]** *Allg. Forst- und Jagdztg.* 117, 1941 (22–8). [G.] [Waldbauliches Institut, Freiburg i. Br.]

92 (54.2) : 23.3 : 34.27. UNITED PROVINCES. **The Fodder and Grazing Committee report for 1939–40.** *Bull. U.P. For. Dep.* No. 17, 1940. [pp. 3.]

The new Tenancy Act, by which a tenant has the right to the trees planted on his holding, has given impetus to the scheme of village plantations, which is being promoted by the Forest Department (p. 2.).

92 (68) : 4 : 94 : 98. UNION OF SOUTH AFRICA. **Annual report of the Division of Forestry for the year ended 31st March, 1940.** Govt. Printer, Pretoria. 1940. pp. 37.

Included in a Forest Bill introduced in the House of Assembly is legislation relating to: (i) Expropriation of land, or the suspension of the owners' rights therein, where, in the national interest, extensive reclamation measures are to be undertaken by the State or vegetation is to be protected. (ii) Protection against forest fires and control of veld burning by means of (*a*) giving notice of intention to burn, and (*b*) co-operation in the construction of firebreaks. (iii) Private forests—raising their status to that of Crown forests in regard to protection of forests and forest produce. (iv) The growth of the local timber industry, based on the utilization of plantation-grown timbers. (v) Control and eradication of tree and timber diseases and pests (pp. 5–6).

92 (71.4) : 94.11. LUSSIER, O. Résumé de droit forestier domanial. **[Summary of Crown Forest law.]** Programme national forestier, Entente Bourque-Rogers, Province de Québec. Ministère des Terres et Forêts, Québec. 1939. pp. 4. [F.]

92 (74.6). **Connecticut laws relating to forests and forestry.** State Forester, Hartford, Conn. 1939. pp. 76.

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A plea for the establishment of communal forestry in Queensland.

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95. FOREST TAXATION

95.1 (410). GARDINER, R. S. **Taxation of woodlands in England and Wales.** *Quart. J. For.* 35, 1941 (50–8).

An outline of the present position.

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97.1 : 60. PETERSON, L. E. **Forest community planning.** *J. For.* 39, 1941 (179–85).

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Discussion of the possibilities of Government control over private forests in the United States.

97.2 : 60.31.2 : 94.34 (73). **Policies and procedures for the Farm Forestry Program of the Department of Agriculture under the Co-operative Farm Forestry Act.** U.S. Department of Agriculture, Washington, D.C. [Revised ed.] 1940. pp. 6.

97.2 : 60.31.2 (410). ROGER, Sir A. **Suggestions for a plan.** *Quart. J. For.* 35, 1941 (40–50).

It is suggested that the initiative for the improvement of private forestry in Britain should come from the landowners themselves. They should form an organization to elaborate and pursue a far-reaching forest policy. The State should provide financial assistance, the advances to be repaid as far as possible. The funds could be allotted by the governing body of the organization of woodland owners for such purposes as the provision of instructional facilities for owners, agents, and foresters; provision of skilled forest labour; maintenance of a staff of forestry experts who would each have charge of a land unit or, alternatively, arrangement for management of private woodlands by existing firms of professional foresters; co-operative marketing; and actual financial assistance to owners depending on the extent to which they took advantage of the facilities offered. Each wood should be managed according to a printed working plan. In the case of small estates several woods could be worked under one plan.

98. THE TIMBER MARKET

98.1. HAYWARD, P. A. **Recent trends in world trade in lumber as affected by the war.** *Sth. Lumberm.* 162 (2037), 1941 (27–30). [U.S. Department of Commerce.]

98.1 (410). DAVEY, R. **A scheme for home timber supplies.** *Quart. J. For.* 35, 1941 (62–6).

The author suggests that the present delay, in Great Britain, in the purchase of growing trees is due chiefly to too many measurements being involved and could be avoided if purchase were by requisition. Felling could

follow closely on requisition, and the trees measured but once, by women measurers, who would stamp contents on the butt of each log. This volume would serve for payment to owner, feller, and haulier, and for all subsequent purchases. Railway weight might serve as a measure for pitprops.

98.1 (73). UNITED STATES. **[Report of the Lumber Survey Committee on Consumption, Stocks and anticipated Consumption of Lumber during the first quarter of 1941.]** U.S. Department of Commerce, Washington, D.C. 1941. pp. 7 + tbls.

The lumber export trade of the United States has declined seriously. Report on domestic consumption shows railroad purchases maintained, the furniture market improving and the allocation of federal funds for the construction of 54,082 dwelling units in connexion with the defence housing programme, as well as considerable private building.

98.1 : 35 (78 : 79). TILTON, W. G. **Interdependence of the West Coast log family.** *Paper Tr. J.* 112 (2), 1941 (29–31). P.R.

A discussion of the Douglas Fir and Hemlock resources and of production and marketing conditions in the north-western United States. Stress is laid upon the desirability, from the points of view of both pure utilization and good forestry, of balancing and co-ordinating the various markets for the different types of products and of developing fresh uses for products that cannot be disposed of under present conditions.

98.1 : 99. DIETERICH, V. Beispiele der wehrpolitischen Bedeutung von Forst- und Holzwirtschaft. **[Examples of the importance of forestry and the timber trade in war politics.]** *Forstwiss. Cbl.* 62, 1940 (121–35). [G.] R.M.I.

The present position of forestry and timber production in Germany, Italy, England, Norway, Sweden, Finland, Canada, Holland and Belgium is discussed in relation to the war.

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